

## THE TAXONOMY AND BIOGEOGRAPHY OF THE *LORIAE* GROUP OF THE GENUS *BAETURIA* STÅL, 1866 (HOMOPTERA, TIBICINIDAE)

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The *loriae* group is proposed for a presumably monophyletic group of 9 species. Species of the group combine characters seemingly synapomorphic for the species of *Baeturia* Stål, 1866, with characters seemingly synapomorphic for the species of *Gymnotympana* Stål, 1861. Though the generic relationships of the *loriae* group are not clear, it is included here in the genus *Baeturia*, on account of shared male genital characters. One species (*B. loriae* Distant, 1897) is redescribed and eight species (*B. bemmeleni*, *B. daviesi*, *B. fortuini*, *B. hamiltoni*, *B. hartonoi*, *B. pigrami*, *B. silveri*, and *B. wegneri*) are described as new. *B. loriae* is transferred back from *Gymnotympana* to *Baeturia*. A key to the males is presented. A redescription of *B. tenuispina* Blöte, 1960 is included in this publication, since a character of the clasper indicates a relationship with some species of the *loriae* group. Nevertheless, the attribution of that species to the *loriae* group is far from certain. The *loriae* group is endemic to New Guinea, most species are restricted to the central and eastern mountain ranges of that island.

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Key words. – *Baeturia*, *loriae* group, taxonomy, biogeography, New Guinea.

Current studies of the tibicinid cicadas of eastern Malesia show, that a number of New Guinean and Australian genera form a monophyletic group: 'the *Baeturia* and related genera complex' (de Boer 1990, 1991). The largest genus of this group, *Baeturia* Stål, 1866, appears to be non-monophyletic in its present concept, but, within that genus, several monophyletic species groups have been recognized. Taxonomic and biogeographic revisions have been published so far for the *B. nasuta* group (de Boer 1982), the *B. conviva* group (de Boer 1986), the *B. bloetei* group (de Boer 1989) and the *B. viridis* group (de Boer 1992).

These pages present the revision of a presumably monophyletic group of nine species, for which the name *Baeturia loriae* group is proposed. This group is of particular interest from a taxonomic point of view, since its species combine several characters regarded apomorphic for *Baeturia*, with characters apomorphic for *Gymnotympana* Stål, 1861. The distribution of these characters within the group is such, that any reconstruction of the in-group relationships will unavoidably show several conflicting characters. The *B. loriae* group is endemic to northern, eastern and central New Guinea.

*B. tenuispina* Blöte has a character of the clasper in common with some species of the *B. loriae* group, but

differs in most other respects. This species is not attributed to the *B. loriae* group, but described here, since it seems more related to this group than to any of the other species groups of *Baeturia*.

### MATERIAL AND METHODS

The material used for this study comes from the following institutions:

AMS – Australian Museum, Sydney; BMNH – Natural History Museum [formerly: British Museum (Natural History)], London; BPBM – Bernice P. Bishop Museum, Honolulu; CSIRO – Commonwealth Scientific and Industrial Research Organisation, Australian National Insects collection, Canberra; KBIN – Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel; MSNG – Museo Civico di Storia Naturale 'G. Doria', Genova; MVM – Museum of Victoria, Melbourne; RMNH – Nationaal Natuurhistorisch Museum (formerly: Rijksmuseum van Natuurlijke Historie), Leiden; SMN – Staatliches Museum für Naturkunde, Stuttgart; ZMA – Institute for Systematics and Population Biology (Zoologisch Museum), Amsterdam.

The following sources have been used for tracing

the localities: 'Atlas van tropisch Nederland' (1938), 'The Times Atlas of the World (Comprehensive Edition)' (1968), 'Papua New Guinea a travel survival kit' by Tony Wheeler, 1988, Lonely Planet Publications, Victoria, Australia and a 'List of New Guinea localities' published by the Bernice P. Bishop Museum (1966).

To examine the male genitalia, the pygofer was pulled out, after overnight softening, with a sharp needle inserted between the pygofer and the 8th abdominal segment. The aedeagus was pulled out at the same time, by inserting the needle between the claspers. Body and tegmen lengths of all specimens were measured, other measurements are based on a maximum of ten specimens, when available.

#### PHYLOGENY

##### Classification of the *B. loriae* group

The generic classification of the *loriae* group presents a major problem. As stated above, the species combine characters of *Baeturia* with characters of *Gymnotympana*. Some of these characters appear to be unique for either *Baeturia* or *Gymnotympana* (or part of these genera). The distribution of these characters within the *loriae* group is not homogeneous; some species have more in common with *Baeturia*, others more closely resemble *Gymnotympana*.

The following characters are found in the *loriae* group and indicate a relationship with *Baeturia*, the first four are presumed apomorphies for that genus.

- (1) a strongly curved aedeagus, tapering to its apex, with bluntly rounded lateral lobes and oval aedeagus pore. This aedeagus shape is unique for *Baeturia*.
- (2) a narrow vertex, with large ocelli close together (fig. 3). Two species of *Gymnotympana* have an even narrower vertex. In other species of the complex, the vertex is broader than in *Baeturia*.
- (3) a broad and triangular middle spine on fore femur (fig. 19) is shared by all species of *Baeturia*.
- (4) a fairly narrow and frontally bluntly rounded postclypeus, distinctly protruding beyond vertex lobes and, in most species, distinctly and angularly swollen ventrally (figs. 3-4). A similar swelling only occurs in some species of *Baeturia*, the narrow, protruding, and rounded shape of the postclypeus is possibly apomorphic for *Baeturia*.
- (5) a rather stout caudodorsal beak, often angularly bent and curved over anal valves. Other species of the complex have a much shorter and erect beak. The curved caudodorsal beak is probably synapomorphic for several of the *Baeturia* species groups together.
- (6) almost straight parallel claspers, separated at the

base, and with a broad and rounded ventral hollow in the apical part. Such separated claspers are unique for *Baeturia* and *Scottotympana* de Boer, 1991.

- (7) a distinct and angular clasper heel (in *B. bemmeleni*, *B. hamiltoni*, and *B. wegeneri*). A clasper heel is found in many species of *Baeturia*, but not in other genera.
- (8) rows of setae on veins of tegmina and wings (in *B. hamiltoni* and *B. wegeneri*). Similar rows of setae are found in many *Baeturia* species, but not in any of the related genera. However, such setae also occur, though more distinctly, in several genera of the Prasiini, a possible sister group of the '*Baeturia* and related genera complex'.
- (9) dense brown speckling on body (in *B. daviesi* and *B. wegeneri*). Such speckling, though strongly variable in density, only occurs within *Baeturia*.
- (10) irregularly shaped brown spots on tegmina (in *B. pigrani* and *B. silveri*, fig. 59). Such spots are only found in some species of *Baeturia* (e.g. *B. guttulinervis*, *B. guttulipennis* and *B. nasuta*).
- (11) a distinct crest between the aedeagal lobes. A similar crest occurs in some species of the *B. conviva* group and some species related to that group.

Other characters found in the *B. loriae* group do not occur in other species groups of *Baeturia*, but seem to indicate a relationship with *Gymnotympana*. The first two must possibly be regarded as apomorphies for *Gymnotympana*, others are either restricted to part of that genus, or occur in several other genera as well.

- (1) sexual dimorphism in wing venation (males with very slender anal fields, compare figs. 59 and 84) is shared by all species of *Gymnotympana*, but does not occur in other genera of the complex. (Similarly slender anal fields are recorded for *Prasia* Stål and *Plautilla* Stål (Boulard 1975), however. In *Prasia* this character is restricted to the males, but the literature does not record such dimorphism for *Plautilla*).
- (2) a sharp ventrolateral fold in tergites 4-7 (more or less distinct in all species) is shared by nearly all species of *Gymnotympana*, but not found in related genera.
- (3) an enlarged distal part of male operculum. Both, the broadly rounded shape (as found in *B. bemmeleni*, *B. hamiltoni*, and *B. wegeneri*), as the triangular shape (as found in *B. daviesi*, *B. fortui*, and *B. pigrani*), are found in *Gymnotympana*, but do not occur in related genera.
- (4) a very short, often rudimentary meracanthus

(found in all species with enlarged opercula) is shared by *Venustria* Goding & Froggatt, 1904 and most species of *Gymnotympana*. This character might be coupled to the character described immediately above.

- (5) a laterally elongate basal part of male operculum (in six species) is shared by nearly all *Gymnotympana* species and not found in other genera.
- (6) a broad hyaline border along hind margin of tegmen (in *B. fortunei* and *B. loriae*, fig. 84) is shared by all species of *Gymnotympana*, *Scottotympana*, and *Venustria*.
- (7) an inwards curving ventral corner of tymbal, with strongly inwards directed connecting bar between abdomen and tymbal (only found in *B. fortunei*) is found in most species of *Gymnotympana*, but not in other related genera.
- (8) furthermore, all species except *B. daviesi* and *B. wegeneri* have a more or less distinct colour pattern of dark streaks and spots on head, pronotum, and abdomen (figs. 8-9). This colour pattern is much more distinct than in other species of *Baeturia*. An even more distinct colour pattern is found in many *Gymnotympana* species, in *Scottotympana* and in two species of *Chlorocysta* Westwood, 1851. Since these patterns are very variable between the various species, it is not clear whether the patterns found in the *loriae* group can be considered homologue with those in *Gymnotympana*.

The *loriae* group thus, seems to combine some apparently convincing synapomorphies of *Baeturia* and *Gymnotympana*. At this point of investigation, with several groups of the 'Baeturia and related genera complex' still undescribed, and with only vague indications as to the possible sister groups of the complex, it is not possible to fully evaluate the meaning of the character distribution in the *loriae* group. Current phylogenetic analysis, involving all species of the 'Baeturia and related genera complex', however, shows that a monophyletic *loriae* group as part of the genus *Baeturia*, is the most parsimonious solution. Furthermore, this solution is in accordance with the distribution of all male genital characters.

Nevertheless, the remarkable number of conflicting characters concentrated in the *loriae* group is upsetting to any phylogenetic reconstruction. Whatever generic allocation of the *loriae* group is favoured, the parallel evolution and / or the successive gain and loss of several characters must be presumed. Biochemical study of the *loriae* group could be interesting as a test for a hybrid origin of that group.

#### Monophyly of the *B. loriae* group

The above discussed combination of characters found in the *loriae* group involves all those characters

that would, by non-existence of that group, be used as apomorphies for either *Baeturia* or *Gymnotympana*. As a result neither *Baeturia* nor *Gymnotympana* can be properly defined by shared apomorphies in exclusion of the *loriae* group. But also for the *loriae* group itself, no unambiguous apomorphies could be found. The group can be best defined by the unique combination of two characters: sexual dimorphism in wing, and an S-curved aedeagus with lateral lobes at the base of the curvature. Furthermore, there are three characters shared by all, or nearly all, species of the group, and not widely distributed outside the group, that could indicate a close relationship between the species. These characters are: 1) a distinct crest between the lateral lobes of aedeagus, only shared by some species of the *B. conviva* group and two species related to that group; 2) an enlarged and angularly rounded ventral part of the lateral lobe of pygofer, shared by only a few species of *Gymnotympana* (e.g. *G. stridens*); and 3) a rather short and broad eighth apical area of tegmen, tending to be shorter than in *Gymnotympana* or other species of *Baeturia*. The latter character is somewhat variable within the species and cannot be used as a diagnostic character.

#### Ingroup phylogeny

As long as the problems concerning the phylogenetic position of the *loriae* group, relative to other species groups of *Baeturia* and to the genus *Gymnotympana*, are not satisfactorily solved, characters that occur either in *Baeturia* or *Gymnotympana* and also in some species of the *loriae* group cannot be properly evaluated as plesiomorphous or apomorphic, and can therefore not be used in a phylogenetic reconstruction of the group. Only the distribution of characters that appear to be unique for some species of the *loriae* group allows some remarks on ingroup phylogeny.

*B. bemmeleni*, *B. hamiltoni*, and *B. wegeneri* almost certainly form a monophyletic group. These species share an almost identical clasper, characterized by a nearly rectangular dorsal corner (figs. 11, 26, and 30), which is regarded synapomorphic. Furthermore, these species share an almost identical male operculum; very broad, slightly domed and broadly rounded at its apex (figs. 14, 22, and 38). A very similar operculum was found in *G. olivacea* Distant, 1905, but in that species the lateral margin of operculum is almost continuous with the lateral crest of operculum base. Some undescribed *Gymnotympana* species, related to *G. olivacea*, have a similarly broad and curved, but more angular, square-shaped, operculum.

*B. daviesi*, *B. fortunei*, *B. hartonoi*, *B. loriae*, *B. pigrami*, and *B. silveri*, most probably form a monophyletic group on account of a shared dorsal protrusion on the clasper. This protrusion is partly, or complete-



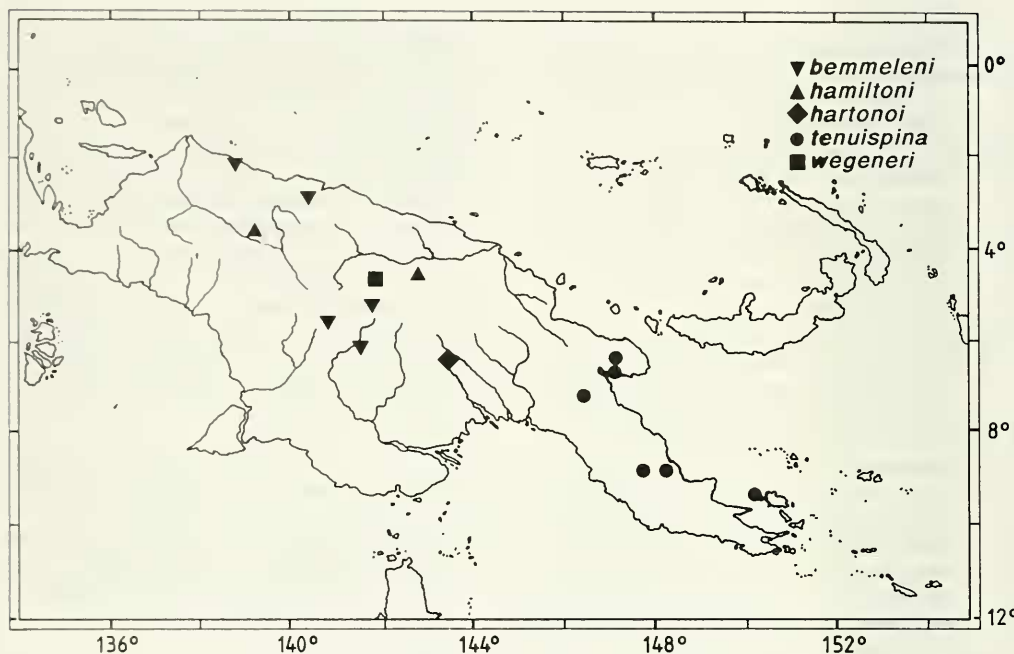


Fig. 1. Localities of *Baeturia bemmeleni*, *B. hamiltoni*, *B. hartonoi*, *B. tenuispina*, and *B. wegeneri*.

ly fused with the upwards curving proximal part of the dorsal margin of clasper, and merges with the clasper base, were in many other *Baeturia* species the clasper heel is formed. *B. tenuispina* Blöte has a similarly shaped protrusion at the corner of its clasper heel (fig. 97) and should possibly be included in this group.

In *B. daviesi*, *B. pigrami*, and *B. silveri* the dorsal protrusion is very distinct and finger-shaped (figs. 40, 50, 64); in *B. hartonoi*, this protrusion is more angular and strongly curved mesiad (fig. 70); and in *B. fortuini* it is rudimentary and only recognizable in the specimens from Mt. Missim (fig. 79). The dorsal protrusion is believed to be lost in the lectotype of *B. loriae* and the remaining specimens of *B. fortuini*.

The clasper of these six species is very broad in lateral view; the dorsal margin of the clasper curves upwards from clasper base, so that no clasper heel is formed. This clasper-shape is probably also synapomorphic.

*B. fortuini*, *B. loriae*, and *B. hartonoi* possibly form a monophyletic group on account of the shared elongate lateral lobes of aedeagus (figs. 73, 82, 92), and the very broad, angular and laminiform clasper.

*B. fortuini* and *B. loriae* are very closely related and probably sister species. They share triangular bronzed spots in the tegmina (fig. 84) and a very long and slender aedeagus (figs. 82, 92). Possibly these two

species are synonyms, and the lectotype of *B. loriae* is just an aberration.

The relationships between *B. daviesi*, *B. pigrami*, and *B. silveri* are less clear. These species share a triangular clasper, with convex dorsal margin (lateral view), which must probably be regarded more primitive than the squarely laminiform clasper of the three species mentioned above. Especially the claspers of *B. daviesi* and *B. pigrami* are very similar, sharing a broadly rounded and outcurving dorsal lobe, but the clasper of *B. hartonoi* has a very similar outcurving lobe. *B. pigrami* and *B. silveri* are conspicuous by the brown patches along veins of tegmina. But *B. guttulineris* Blöte and *B. guttulipennis* Blöte, two otherwise very different and not closely related species, have similar patches.

Table 1. Altitudinal ranges of the species of the *B. loriae* group in meters above sea level.

|                     |                     |
|---------------------|---------------------|
| <i>B. bemmeleni</i> | 35-1350             |
| <i>B. fortuini</i>  | 1100-2100           |
| <i>B. hamiltoni</i> | 50-1200             |
| <i>B. hartonoi</i>  | 100                 |
| <i>B. loriae</i>    | 1300                |
| <i>B. pigrami</i>   | 120-1260            |
| <i>B. silveri</i>   | 1800-2590 (8500 ft) |
| <i>B. wegeneri</i>  | 250                 |



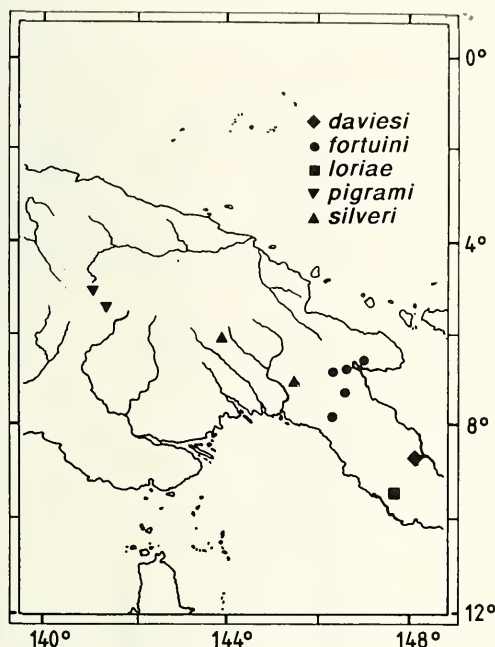


Fig. 2. Localities of *Baeturia daviesi*, *B. fortuini*, *B. loriae*, *B. pigrami*, and *B. silveri*.

#### BIOGEOGRAPHY

The *B. loriae* group is endemic to New Guinea, and distributed in the northeastern part of Irian Jaya, and in central and eastern Papua New Guinea. Many specimens come from, or close by, the central and eastern mountain ranges. The group seems to consist mainly of montane species, probably with very restricted areas of distribution, often reaching altitudes of over 1000 m (table 1).

It is remarkable, that the subdivision made above, between *B. bemmeleni*, *B. hamiltoni*, and *B. wegeneri* versus the remaining species, is a subdivision between a mainly western and a mainly eastern species group (figs. 1, 2).

#### TAXONOMY

##### Description of the *B. loriae* group

The species of the *B. loriae* group are predominantly brown coloured, sometimes greenish tinged. *B. wegeneri* and *B. daviesi* are densely speckled with small brown spots, the other species are conspicuous by a colour pattern of regularly distributed dark markings. These species generally have two dark spots or longitudinal streaks between eyes and lateral ocelli and often darkened lateral corners of postclypeus; a light immaculate middorsal band on pronotum, some-

times bordered by almost black lines, and dark brown streaks in and along the oblique fissures. The dark markings on the mesonotum form two semi-circular paramedian spots, at pronotal collar, two blackened dents in front of cruciform elevation and lateral bands, converging from pronotal collar to edges of elevation. The cruciform elevation and a triangular area in front of the elevation is generally light ochraceous and unmarked. On the male abdomen, dark markings tend to form dorsal, and sometimes lateral bands, while a latero-ventral row of dark spots is often very clear. The dorsal markings tend to be interrupted middorsally by a narrow lighter coloured line. Ventral side of male abdomen generally light ochraceous, segmental hind margins often red. Female abdomen more irregularly dark spotted all over, though the light middorsal band is often more conspicuous.

Females are shorter than males (on average), but have a larger, more robust head and thorax and often longer tegmina.

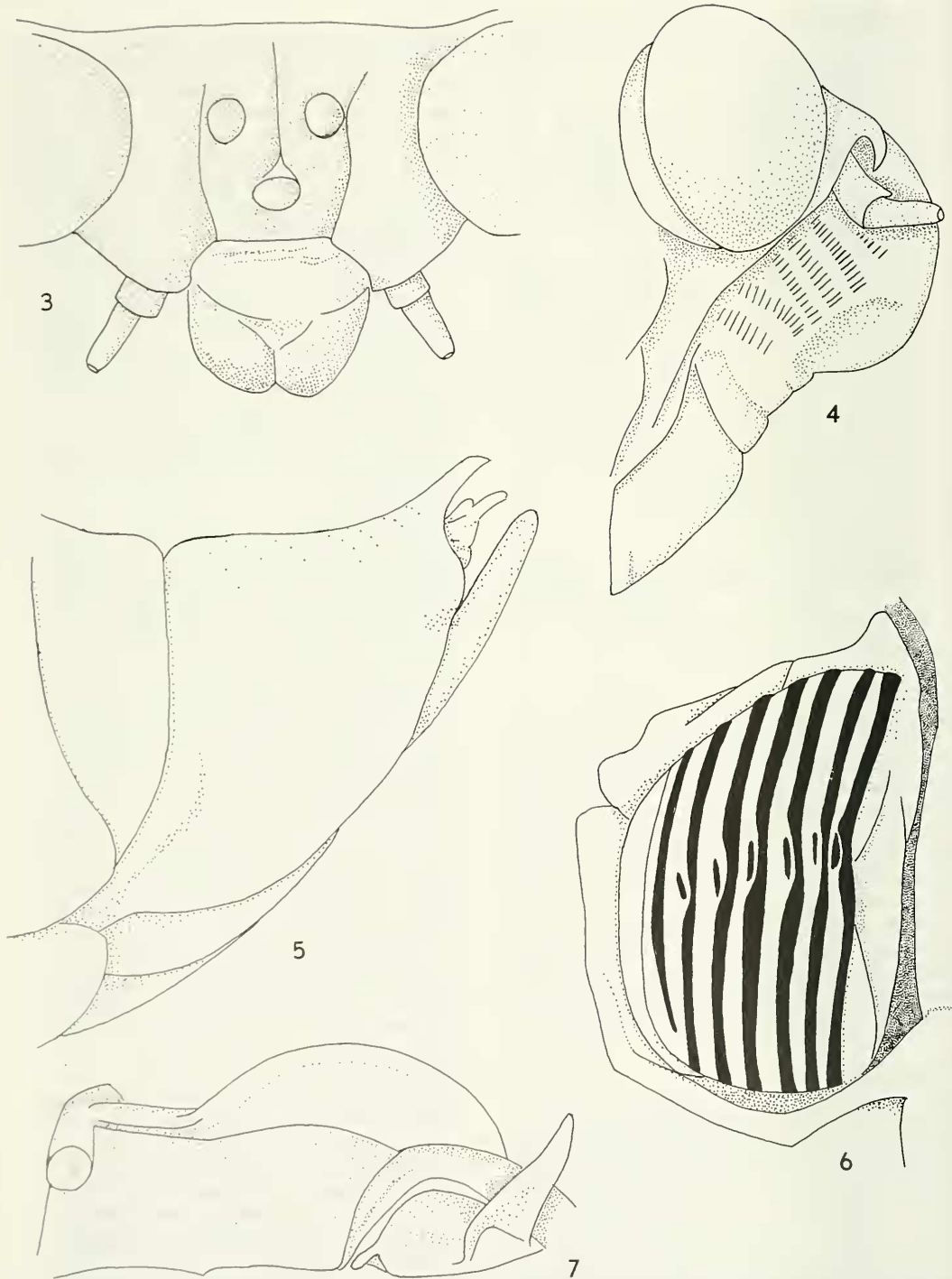
Head in dorsal view (fig. 3): Postclypeus distinctly protruding beyond vertex lobes and broadly rounded at frontal margin. Postclypeus  $1.2-2.2\times$  as broad as long and  $0.5-0.7\times$  as broad as distance between eyes, strongly varying within the species. Head  $0.7-0.8\times$  as wide as pronotal collar and only slightly narrower than anterior width of pronotum. Vertex narrow, ocelli large and close together. Distance between lateral ocelli less than  $1.5\times$  the width of frontal ocellus and  $0.7-1.4\times$  as long as distance between eye and lateral ocellus. Eye  $0.6-0.8\times$  as wide as distance between eyes. Head  $0.9-1.2\times$  as long and  $2.2-2.6\times$  as wide as distance between eyes.

Legs: Ochraceous, sometimes with longitudinal brown stains on femora and tibia. Fore femur (fig. 19) with row of three sharply pointed spines, diminishing in length towards tibia. Proximal spine about as long as distance to middle spine. Middle spine broad, triangular.

Tegmina and wings: Hyaline, though tegmina in some species with brown markings. Venation ochraceous, costa often reddish. Tegmina with 8, wings with 6 apical areas. Costal area of tegmen very narrow. Anal fields of wing in male distinctly narrower than in female (compare figs. 59 and 84).

Tymbal organ (fig. 6): Six or seven parallel transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin. Short intercalary ridges forming a midlateral band across tymbal.

Opercula: Basal part of operculum vaulted, with distinct crest around rectangular distolateral corner. Distal part of male operculum either very long and domed, and completely covering tymbal cavity in ventral view; or short, oblong-shaped, laminiform and flat against body, only partly covering tymbal cavity. Distal part of operculum medially extending



Figs. 3-7. *Baeturia hamiltoni* sp. n. – 3, Head in dorsal view; 4, postclypeus in lateral view; 5, female genital segment in lateral view; 6, tymbal; 7, female operculum.

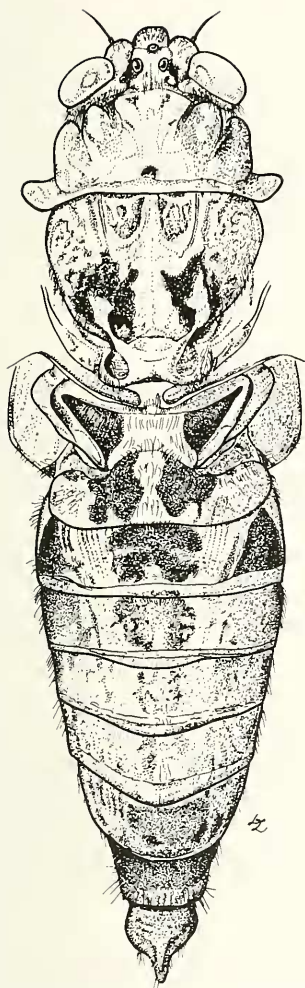


Fig. 8. *Baeturia hamiltoni* sp. n., habitus male.

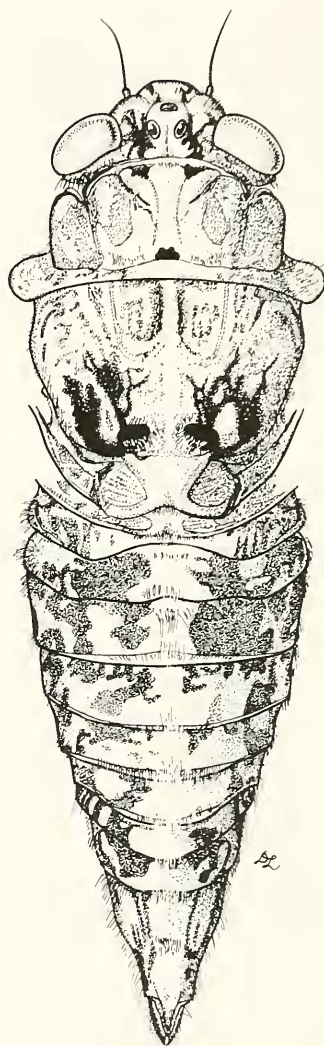


Fig. 9. *Baeturia hamiltoni* sp. n., habitus female.

beyond meracanthus. Distal part of female operculum short, sickle-shaped and erect, medially extending just to base of meracanthus. Basal part of female operculum forming narrow rim around base of meracanthus.

Abdomen: With tergites 4-7 of the male abdomen sharply folded at the ventrolateral edge of abdomen, though these folds are not always distinct in all specimens.

Male genitalia: Pygofer with stout and often angularly bent caudodorsal beak. Lateral lobes of pygofer with small and bluntly rounded protuberances, that do not extend beyond pygofer margin. Lateral lobes

strongly folded inwards. Claspers parallel and directed posteriad, slightly bending down towards their apices. Apical part of clasper with small, rounded and sharply edged clasper hollow. Aedeagus strongly S-curved, with two narrowly elongate lateral lobes at base of S-curvation, and a distinct crest between lateral lobes. Aedeagus in lateral view broad at base, gradually narrowing to pointed apex.

Female genitalia: Caudodorsal beak sharply pointed at apex. Ovipositor sheaths reaching just beyond apex of beak (fig. 5).

Etymology: This revision is to form part of an area cladistic study of the New Guinean region, in which



the general patterns of distribution of organisms are compared to the geological history of that island. The new species described in this publication are named in honour of geologists, who contributed to a paleogeographic reconstruction of the area. The species are named after R. W. van Bemmelen, H. L. Davies, A. R. Fortuin, W. B. Hamilton, H. M. S. Hartono, C. J. Pigram, E. A. Silver, and A. Wegener.

### Key to the males

1. Clasper with distinct angular clasper heel; apical part of clasper slender in lateral view, with rectangular dorsal corner (fig. 11). Distal part of operculum broad and long, weakly domed, and broadly rounded at apex (fig. 14) .....2
- Clasper without clasper heel; apical part of clasper in lateral view broader than clasper base, often with dorsal protrusion, partly fused to proximal part of dorsal margin (fig. 40). Distal part of operculum either oblong and flat (fig. 41), or triangular, domed and pointed (fig. 51) at apex .....3
2. Body densely speckled all over, not forming an unspckled or lighter coloured middorsal band ..  
.....*B. wegeneri*
- Body not speckled, but with regularly distributed dark markings and an immaculate middorsal band over part or whole length of body .....4
3. Body length 25.4–29.7 mm. Caudodorsal beak broad and truncate at apex .....*B. hamiltoni*
- Body length 17.1–21.3 mm. Caudodorsal beak narrowly truncate or pointed at apex .....  
.....*B. bemmeleni*
4. Aedeagus very long, with elongate and slender lateral lobes (fig. 82). Clasper quadrangular in lateral view; dorsal part of clasper angular, laminiform (figs. 70, 79, 80, 89) .....5
- Aedeagus short and broad, lateral lobes not elongate (fig. 45). Clasper triangular in lateral view; dorsal part of clasper swollen, with weakly convex dorsal margin (figs 40, 50, 64) .....7
5. Postclypeus not swollen in lateral view. Tegmen immaculate. Aedeagus angularly bent to apex (fig. 73). Clasper with dorso-lateral lobe (fig. 70) .....  
.....*B. hartonoi*
- Postclypeus distinctly swollen in lateral view. Tegmen with triangular brown spots in apical areas (fig. 84). Aedeagus not angularly bent to apex (fig. 81). Clasper without dorso-lateral lobe (fig. 79) .....6
6. Distal part of operculum triangular, domed and narrowly rounded at apex (fig. 77). Margin of aedeagus pore concave at apex (fig. 83) .....*B. fortuini*
- Distal part of operculum square-shaped, flat against body (fig. 91). Margin of aedeagus pore not concave at apex (fig. 93) .....*B. loriae*

7. Tegmina with brown markings along veins (fig. 59) .....8
- Tegmina immaculate .....*B. daviesi*
8. Postclypeus angularly swollen in lateral view. Distal part of operculum triangular and slightly domed. Hind margin of tegmen with distinct hyaline border .....*B. pigrami*
- Postclypeus not swollen in lateral view. Distal part of operculum square-shaped and flat against body. Hind margin of tegmen with narrow hyaline border .....*B. silveri*

### Description of the species

#### *Baeturia hamiltoni* sp. n.

(figs. 1, 3–20)

Type material. – Holotype ♂: 'Neth. Ind.-American New Guinea Exped. Rattan camp, 1200 m, 6.iii.1939, L. J. Toxopeus', RMNH. – Paratypes: IRIAN JAYA: NEW GUINEA (W): Araucaria camp, 800 m, 8.iii.1939, L. J. Toxopeus, 1♂, 3♀, RMNH; same data but 9.iii.1939, 1♂, 1♀; 10.iii.1939, 3♀; 11.iii.1939, 1♂; 12.iii.1939, 1♀; 16.iii.1939, 1♂, 2♀; 20.iii.1939, 1♀; 21.iii.1939, 2♂; 22.iii.1939, 2♂, 2♀; 24.iii.1939, 2♀; 25.iii.1939, 1♂; 29.iii.1939, 1♂, all RMNH; same data but 19.iii.1939, 2♀; 28.iii.1939, 2♂, all ZMA; Bernhard camp, 100 m, 11.iv.1939, L. J. Toxopeus, 2♀, RMNH.

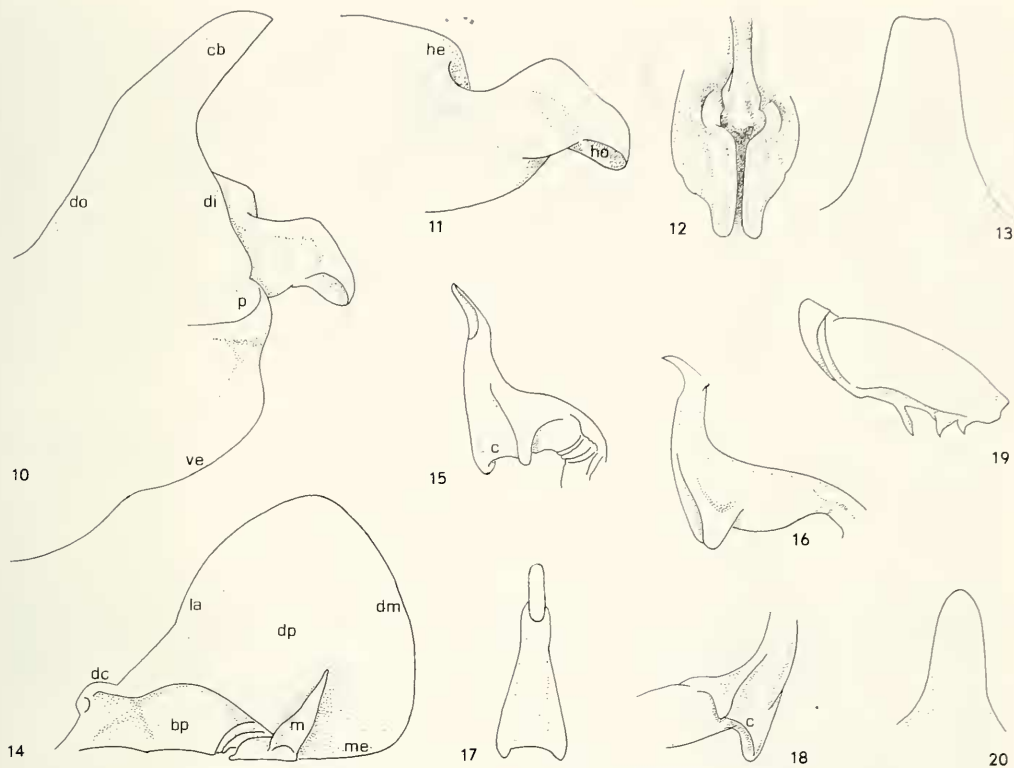
Other material. – PAPUA: NEW GUINEA (NE): Ambunti, Sepik R., 50 m, 10.v.1963, R. Straatman, 1♂, BPBM.

*B. hamiltoni* is a large brown coloured, species with a light middorsal band on head and thorax, sometimes continuing over abdomen. The species is easily recognized by a small and almost black medial spot on pronotum, at pronotal collar. Females have a glistering middorsal band of silvery setae on the abdomen, making the light and immaculate middorsal band more conspicuous than in males.

#### Description

Body of males brown, abdomen sometimes reddish, with distinct colour pattern of darkened markings and an immaculate middorsal band on head and thorax, sometimes continuing over abdomen. Females on average slightly smaller than males, with more robust head and thorax, but shorter abdomen and considerably longer tegmina. Male abdomen 1.3–1.4× as long as head and thorax, of female 0.9–1.0×. Tegmina of males 1.1–1.2× as long as total body length, of females 1.4–1.5×.

Head (fig. 3): Light brown, with traces of red around ocelli, longitudinal dark brown to black streaks on vertex lobes, between eyes and lateral ocelli, and often brown spots at margins of postclypeus. Postclypeus very stout, 1.3–1.9× as long as broad, distinctly protruding beyond vertex lobes and broadly rounded at anterior margin. Postclypeus in lateral view (fig. 4) strongly inflated, and angularly protruding; dorsal part of anterior margin (lateral view) al-



Figs. 10-20. *Baeturia hamiltoni* sp. n. — 10, pygofer in lateral view; 11, clasper in lateral view; 12, clasper in dorsal view; 13, male caudodorsal beak in dorsal view; 14, male operculum; 15, aedeagus from aslant; 16, aedeagus in lateral view; 17, aedeagus from behind; 18, detail crest between lateral lobes of aedeagus; 19, fore femur; 20, female caudodorsal beak in dorsal view. Lettering: bp = basal part of operculum; c = crest between lateral lobes of aedeagus; cb = caudodorsal beak; dm = distomedial margin of operculum; di = distal margin of pygofer; dc = crest around distolateral corner of basal part of operculum; do = dorsal margin of pygofer; dp = distal part of operculum; he = clasper heel; ho = clasper hollow; la = lateral margin of operculum; m = meracanthus; me = medial margin of operculum; p = protuberance on lateral lobe of pygofer; ve = ventral margin of pygofer.

most straight, ventral part strongly concave. Head very narrow between eyes, distance between lateral ocelli only slightly larger than width of frontal ocellus. Distance between lateral ocelli  $0.8\text{--}1.2\times$  distance between eye and lateral ocellus. Head narrower than anterior part of pronotum.

Thorax: Pronotum brown, with broad dark brown streaks, in and along oblique fissures, and broad, immaculate medial band. Markings variable in intensity and shape, and sometimes completely absent. All specimens with a small dark brown or black middorsal spot at margin of pronotal collar. Mesonotum light brown, with two paramedian dark spots at pronotum margin, darkened lateral streaks converging from pronotal collar to corners of cruciform elevation and two black spots in front of elevation. Cruciform elevation, and a narrow triangular area in front of el-

evation, often reaching to pronotal collar, light ochraceous and immaculate.

Legs: Fore femur (fig. 19) with row of three erect spines, diminishing in length towards tibiae.

Tegmina and wings: Hyaline, though slightly bronzed, venation ochraceous or reddish tinged, but costa often bright red. Veins densely set with short setae. Tegmina with very short apical areas, 8th area almost square-shaped, and with a very narrow hyaline border along hind margin. This border slightly broader in wings.

Tymbal organs (fig. 6): Tympanum not curving inwards; connecting bar between tymbal and abdomen quite short and almost parallel to body axis. Six transverse sclerotized ridges spanning the tymbal, from dorsal to ventral margin. A 7th ridge, close to proximal tymbal margin, almost reaching ventral margin.

Six short intercalary ridges seem to form a band across tymbal.

**Opercula:** Male operculum (fig. 14) ochraceous brown with darkened streaks. Basal part of operculum almost oblong-shaped, but at half-width slightly longer than at lateral or medial margin. Distal part of operculum very broad, shell-shaped, and almost flat against body. Operculum broadly rounded at apex and reaching to, or beyond, margin of abdominal segment 3. Distomedial margin and distal  $\frac{1}{2}$  of lateral margin convex, proximal  $\frac{1}{2}$  of lateral margin straight. Medial margin short and straight, recurving to base of meracanthus. Opercula well separated medially; 1st sternite slightly elevated between opercula, with distinct distal lobe. Meracanthus very short, reaching to about  $\frac{1}{2}$  the operculum length. Female operculum (fig. 7) sickle-shaped and erect, with weak crest along distal margin; area between operculum and base of meracanthus broad and flat.

**Abdomen:** Male abdomen light brown, with some darker brown spots on lateral sides and latero-ventral rows of dark spots on segments 3-7. Segments 2-7 darkened dorsally as well, though these markings often interrupted by a narrow lighter middorsal band. Segment 8 almost entirely dark brown, but pygofer ochraceous. Ventral side of abdomen light brown, immaculate. Segmental hind margins often reddish. Anterior margin of 2nd tergite convex medially; antero-lateral sides of 2nd tergite distinctly swollen adjacent to tymbal. Female abdomen more irregularly spotted all over. Light middorsal band more conspicuous than in males, often glistening with short, silvery setae. Ovipositor sheaths reaching just beyond apex of caudodorsal beak (fig. 5). Female caudodorsal beak (fig. 20) stout, slightly erect and rounded at apex.

**Male genitalia:** Pygofer slender in lateral view as in fig. 10. Dorsal margin straight, angularly bending into stout, short and slightly erect caudodorsal beak. Distal margin straight angularly bending into margin of beak. Lateral lobes of pygofer strongly curved inwards, with bluntly rounded lateral protuberances. Ventral margin angularly convex, but concave near base of pygofer. Caudodorsal beak in dorsal view (fig. 13) broad and truncate at apex. Clasper in lateral view (fig. 11) broad at base, with very distinct and angular clasper heel, strongly bent down at half-length, forming almost right angled dorsal corner. Dorsal margin of clasper concave between clasper heel and this dorsal corner. Distinct crest running along  $\frac{2}{3}$  of dorsal margin, and bending outwards around aedeagus towards clasper base. Clasper hollow short, broadly rounded at apex. Clasper in dorsal view (fig. 12), with dorsal margins of clasper bases very close together, leaving only a narrow gap for anal valves. Aedeagus in lateral view (fig. 16) strongly concave around aedeagus pore, lateral lobes long and slender. Distinct crest,

at base of S-curvation, between lateral lobes (figs. 15, 18). Aedeagus pore (fig. 16) large and oval-shaped.

**Measurements:** Body length  $\delta$ : 25.4-29.7 mm ( $\bar{x}$  27.6 mm  $\pm$  1.3),  $\eta$ : 23.5-28.7 mm ( $\bar{x}$  26.6 mm  $\pm$  1.4); tegmen length  $\delta$ : 28.0-35.0 mm ( $\bar{x}$  32.5 mm  $\pm$  1.8),  $\eta$ : 32.1-40.5 mm ( $\bar{x}$  37.7 mm  $\pm$  2.3); head length  $\delta$ : 2.3-2.6 mm ( $\bar{x}$  2.4 mm),  $\eta$ : 2.4-3.1 mm ( $\bar{x}$  2.6 mm); pronotum length  $\delta$ : 3.1-3.8 mm ( $\bar{x}$  3.5 mm),  $\eta$ : 3.5-4.3 mm ( $\bar{x}$  4.0 mm); mesonotum length  $\delta$ : 5.8-6.6 mm ( $\bar{x}$  6.3 mm),  $\eta$ : 6.5-7.8 mm ( $\bar{x}$  7.1 mm); head width  $\delta$ : 5.5-6.2 mm ( $\bar{x}$  5.8 mm),  $\eta$ : 5.9-6.9 mm ( $\bar{x}$  6.6 mm); width of pronotal collar  $\delta$ : 7.1-8.5 mm ( $\bar{x}$  8.0 mm),  $\eta$ : 8.3-9.9 mm ( $\bar{x}$  9.2 mm).

**Distribution** (fig. 1). — *B. hamiltoni* is known from a very restricted area in Irian Jaya and from one locality in NW Papua.

**Etymology.** — The species is named in honour of the geologist W. B. Hamilton.

**Remark.** — Three females from Araucaria camp that have been described as *B. guttulinervis* Blöte (allo- and paratypes) are very similar in size and colour pattern to the females of *B. hamiltoni*, but have darkened patches along the venation of tegmen, are slightly brown speckled on the pronotum and miss the dark middorsal spot at pronotal collar.

### *Baeturia bemmeleni* sp. n. (figs. 1, 21-29)

**Type material.** — Holotype  $\delta$ : 'NEW GUINEA NETH. Bodom, 100 m, 11 km SE of Oerberfaren, July 7-17, 1959'; 'T. C. Maa Collector', BPBM. — Paratypes: IRIAN: NEW GUINEA (W): Boven Digul gebied [Upper Digul area], 400 km N. Merauke, Dr A. Kalthofen, legit 1926, 1  $\delta$ , ZMA; Boven Sermowai riv.,  $\pm$  400 m, 8.iv.1911, K. G. [K. Gjellerup], 2  $\delta$ , RMNH.

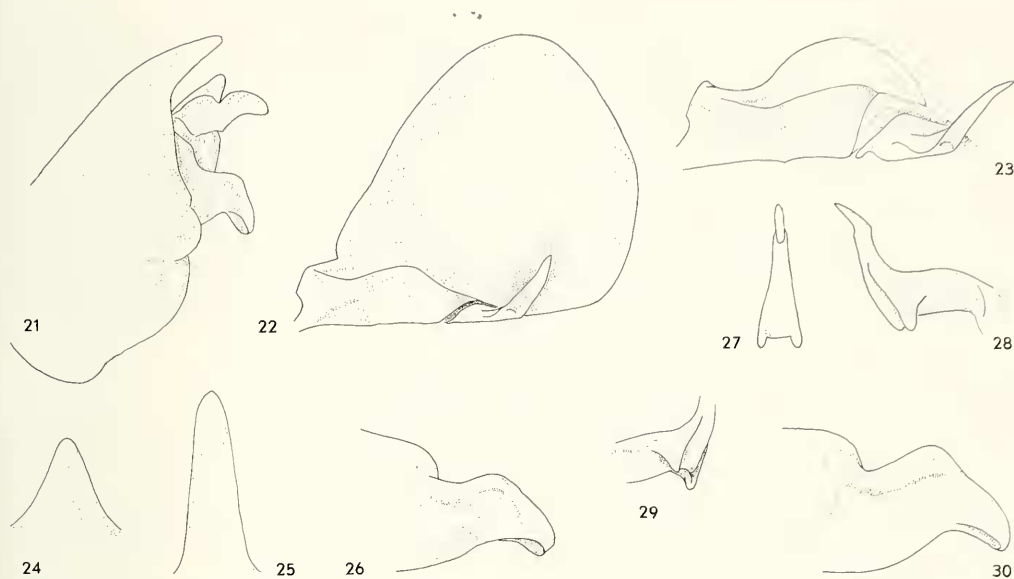
**Other material.** — PAPUA: NEW GUINEA (NE): Eliptamin valley, 1200-1500 m, 16-31.vii.1959, W.W. Brandt, 1  $\eta$ , BPBM; NEW GUINEA (SE): Kiunga, Fly riv., 35 m, viii.1969, J. and M. Sedlacek, 1  $\eta$ , BPBM.

*B. bemmeleni* closely resembles *B. hamiltoni* in shape of male operculum and clasper, but is considerably smaller and less intensely coloured. The female from Eliptamin Valley deviates somewhat in shape and colour pattern, but the shape of its 8th apical area of tegmen suggests that this specimen belongs to the *B. loriae* group and it presumably belongs to this species.

### Description

Body of males ochraceous or reddish brown, with light brown patches, smaller than in foregoing species. Distribution of patches resemble markings in *B. hamiltoni*; leaving a light middorsal band on head and





Figs. 21-30. 21-29: *Baeturia bemmeleni* sp. n. — 21, pygofer in lateral view; 22, male operculum; 23, female operculum; 24, male caudodorsal beak in dorsal view; 25, female caudodorsal beak in dorsal view; 26, clasper; 27, aedeagus from behind; 28, aedeagus in lateral view; 29, detail crest between lateral lobes of aedeagus. — 30: *Baeturia wegeneri* sp. n., clasper.

thorax immaculate. This band sometimes interrupted by a vaguely darkened middorsal spot, at margin of pronotal collar. Females greenish brown, specimen from Eliptamin Valley densely brown speckled. Both females show the light brown middorsal marking on pronotum. Male abdomen  $1.3-1.6\times$  as long as head and thorax, of females  $1.1\times$ . Male tegmen  $1.1-1.2\times$  as long as total body length, of females  $1.3\times$ .

Head: Ochraceous, with brown markings on vertex lobes and along sides of postclypeus, but densely speckled in female of Eliptamin Valley. Postclypeus strongly protruding, almost triangular in dorsal view,  $1.8-2.3\times$  as wide as long. Postclypeus in lateral view, angularly inflated as in *B. hamiltoni*, though in some specimens more rounded at anterior margin. Head about as wide as anterior part of pronotum. Distance between lateral ocelli  $0.7-0.9\times$  as long as distance between eye and lateral ocellus.

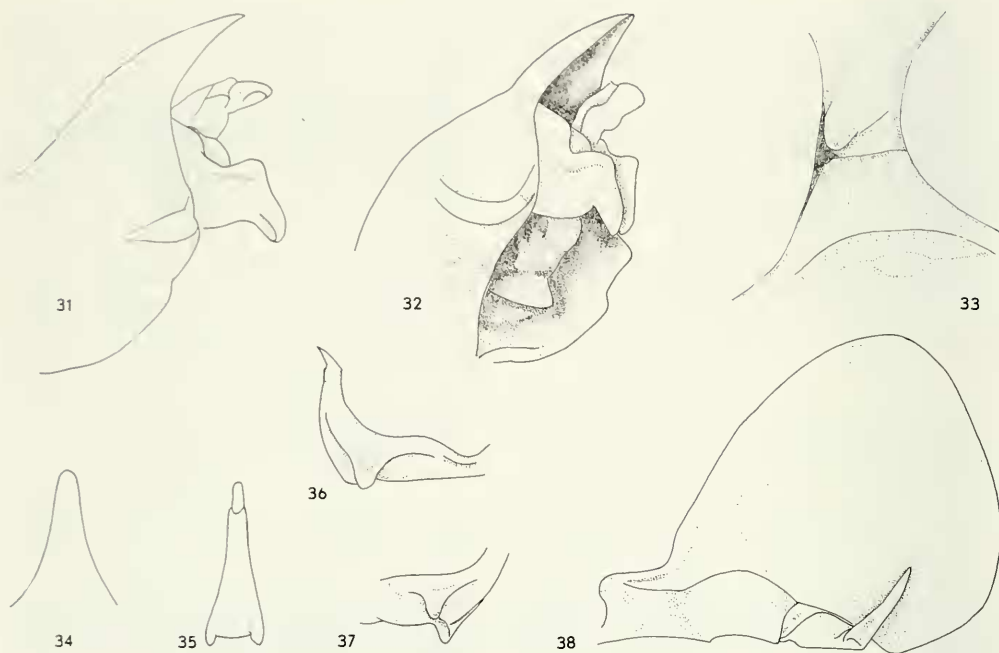
Thorax: Pronotum light brown, with dark brown spots along oblique fissures and a light, but narrow, middorsal band. Female from Eliptamin Valley brown speckled between medial fissures and showing this band only on proximal half of pronotum. Slightly darkened middorsal spot, at margin of pronotal collar, marking end of immaculate band; this spot less clear than in *B. hamiltoni*. Spot U-shaped in one male from Sermowai riv. and the female from Kiunga riv.; connecting two dark lines, running partly along the immaculate middorsal band. Mesonotum variable in

colour pattern between individual specimens, though always with a light, immaculate cruciform elevation and, with exception of the densely speckled female from Eliptamin Valley, with a light middorsal band or narrow triangular area in front of elevation. Two dark spots in front of cruciform elevation.

Tegmina and wings: Hyaline, veins slightly reddened. Tegmina with short 8th apical area, and with narrow hyaline border along hind margin. Wings with slightly broader hyaline border.

Tymbal organs: As in *B. hamiltoni*, not curving inwards, but with connecting bar between tymbal and abdomen distinctly longer and more curved inwards. Six transverse sclerotized ridges spanning the tymbal, from dorsal to ventral margin. A 7th ridge, close to proximal tymbal margin, almost reaching ventral margin. Six short intercalary ridges seem to form a band across tymbal.

Opercula: Male operculum (fig. 22) closely resembling that of *B. hamiltoni*, broadly rounded, shell-shaped, and ochraceous brown with some darkened streaks. Basal part of operculum almost oblong, but weakly tapering mesiad at half its width. Distal part weakly domed, almost flat against body, its rounded apex reaching well beyond margin of abdominal segment 3. Distomedial margin and distal  $\frac{2}{3}$  of lateral margin weakly convex, proximal  $\frac{1}{3}$  of lateral margin more strongly convex. Meracanthus very short, reaching to about  $\frac{1}{4}$  the operculum length. Female opercu-



Figs. 31-38. *Baeturia wegeneri* sp. n. – 31, pygofer in lateral view; 32, pygofer from aslant; 33, first sternite; 34, caudodorsal beak in dorsal view; 35, aedeagus from behind; 36, aedeagus in lateral view; 37, detail crest between lateral lobes of aedeagus; 38, operculum.

lum (fig. 23) sickle-shaped and erect, with broad and flat area between base of meracanthus and medial edge of operculum.

Abdomen: Male abdomen ochraceous brown, stained with dark brown spots, concentrated in nearly continuous middorsal band. Sternites immaculate. A latero-ventral row of clear dark spots on segments 3-7. Segmental hind margins bright red. Anterior margin of 2nd tergite convex medially; sides of 2nd tergite distinctly swollen and adjacent to tymbal. Female abdomen darker brown with irregular brown markings. Latero-ventral row of dark spots less conspicuous than in males. Segmental hind margins ochraceous. Female caudodorsal beak (fig. 25) long, slender, and pointed at apex.

Male genitalia: Pygofer (fig. 21) closely resembling that of *B. hamiltoni*, slender in lateral view. Dorsal margin straight, angularly bending into straight, stout and slightly erect caudodorsal beak. Distal margin straight, angularly bending into margin of beak. Lateral lobes of pygofer strongly incurved, with well-developed, bluntly rounded lateral protuberances. Ventral margin angularly convex, but concave near base of pygofer. Caudodorsal beak (fig. 24) short, sharply pointed or narrowly truncate at apex. Clasper

in lateral view (fig. 26) almost identical to that of *B. hamiltoni*, with very distinct angular clasper heel, and rectangular dorsal corner. Dorsal margin of clasper concave between clasper heel and this dorsal corner. Distinct crest running along  $\frac{2}{3}$  of dorsal margin, and bending outwards around aedeagus towards clasper base. Clasper hollow short, broadly rounded at apex. In dorsal view, dorsal margins of clasper bases wider apart than in *B. hamiltoni*. Aedeagus in lateral view (fig. 28) slender, strongly concave along margin of pore. Lateral lobes long and slender. Distinct crest at base of S-curve, between lateral lobes (fig. 29). Aedeagus seen from behind (fig. 27) very slender. Aedeagus pore narrow and oval.

Measurements: Body length ♂: 17.1-21.3 mm ( $\bar{x}$  18.4 mm  $\pm$  1.7), ♀: 19.3 and 21.7 mm; tegmen length ♂: 19.8-20.4 mm, ♀: 27.8 and 28.6 mm; head length ♂: 1.5-1.8 mm ( $\bar{x}$  1.7 mm), ♀: 1.9 and 2.2 mm; pronotum length ♂: 1.9-2.2 mm ( $\bar{x}$  2.1 mm), ♀: 2.8 and 3.2 mm; mesonotum length ♂: 3.4-3.8 mm ( $\bar{x}$  3.7 mm), ♀: 5.0 and 5.3 mm; head width ♂: 4.2-4.5 mm ( $\bar{x}$  4.3 mm), ♀: 5.0 and 6.0 mm; width of pronotal collar ♂: 5.2-5.4 mm ( $\bar{x}$  5.3 mm), ♀: 6.9 and 7.2 mm.

Distribution (fig. 1). – *B. bemmeleni* is known

from several localities in the northern and central parts of Irian Jaya.

**Etymology.** – The species is named in honour of the geologist R. W. van Bemmelen.

*Baeturia wegeneri* sp. n.  
(figs. 1, 30–38)

**Type material.** – Holotype ♂: 'NEW GUINEA: NE, May R. Petrol sta., 250 m, 3.vi.1963' [print]; 'Dry Forest' [print]; 'R. Straatman Collector BISHOP' [print], BPBM. – Paratype: same locality and collector as holotype but 100 m, 31.v.1963, 1♂, BPBM.

*B. wegeneri* is an ochraceous brown coloured species, with densely brown speckling all over its body, as characteristic for many *Baeturia* species, and in this respect quite different from most other species of the *B. loriae* group. However, *B. wegeneri* is very similar to the two foregoing species in shape of male operculum and genitalia.

**Description**

Body ochraceous brown, densely brown speckled all over. Abdomen strongly inflated,  $1.7\times$  as long as head and thorax. Tegmina about as long as body length.

Head: Ochraceous, brown speckled. Postclypeus broad and oblong in dorsal view,  $1.4\text{--}1.6\times$  as broad as long. Postclypeus angularly inflated ventrally (as in fig. 4). Head narrower than anterior part of pronotum. Distance between lateral ocelli  $0.8\text{--}1.0\times$  distance between eye and lateral ocellus.

Thorax: Pronotum ochraceous, brown speckled in middorsal band and on pronotal collar. Mesonotum grey-brown, densely brown speckled. Two dark spots in front of speckled cruciform elevation, almost lost in speckling.

Tegmina and wings: Hyaline, veins ochraceous or slightly reddish and set with short setae. Tegmen with short and squarish 8th apical area, and narrow hyaline border along hind margin. Wing with slightly broader hyaline border.

Tymbal organs: Not curving inwards, connecting bar between tymbal and abdomen quite short and almost parallel to body axis. Six transverse sclerotized ridges spanning the tymbal, from dorsal to ventral margin. A 7th ridge, close to proximal tymbal margin, almost reaching ventral margin. Six short intercalary ridges seem to form a band across tymbal.

Operculum (fig. 38): Broad and rounded as in foregoing species, ochraceous with some darkened stains near lateral margin. Basal part of operculum almost oblong, but weakly tapering towards mesiad at half its width. Distal part slightly domed, almost flat against body, broadly rounded at apex and reaching

just beyond margin of abdominal segment 3. Distomedial margin and distal  $\frac{2}{3}$  of lateral margin convex, proximal  $\frac{1}{3}$  of lateral margin more strongly convex. Opercula well separated medially, by distinctly smaller and anteriorly lobate first sternite (fig. 33). Meracanthus short, reaching to about  $\frac{1}{2}$  of operculum length.

Abdomen: Ochraceous brown, tergites densely brown speckled all over, sternites unspeckled. Lateroventral row of dark spots almost inconspicuous, by speckling. Segmental hind margins bright red. Anterior margin of 2nd tergite convex middorsally; sides of 2nd tergite weakly swollen and adjacent to tymbal.

Genitalia: Pygofer in lateral view (fig. 31) resembling that of foregoing species. Dorsal margin straight, angularly bending into stout and slightly erect caudodorsal beak. Distal margin straight and more gradually bending into margin of beak. Lateral lobes of pygofer strongly curved inwards, with well-developed, bluntly rounded, lateral protuberances. Ventral margin straight, not concave to base; ventral margins converge to sharp angle at base of pygofer opening (fig. 32). Caudodorsal beak slightly longer than in *B. bemmeleni*, very slender in dorsal view (fig. 34) and sharply pointed apically. Clasper in lateral view (fig. 30) strongly resembling that of two foregoing species, with a very distinct angular clasper heel and rectangular dorsal corner. Clasper strongly bent down to apex at half-length. Distinct crest running along  $\frac{2}{3}$  of dorsal margin. Clasper hollow short and broadly rounded at apex. Dorsal margins of clasper bases wider apart than in *B. hamiltoni*. Aedeagus in lateral view (fig. 36) concave along margin of pore, with broader basal lobes than in *B. bemmeleni*. Distinct crest at base of S-curvation, between basal lobes (fig. 37). Aedeagus from behind (fig. 35) broader than in *B. bemmeleni*, with a short and broad oval pore.

Measurements: Body length: 26.0 and 27.3 mm; tegmen length: 26.4 and 26.6 mm; head length: 2.0 and 2.3 mm; pronotum length: 2.6 and 2.7 mm; mesonotum length: 5.3 mm; head width: 4.7 and 4.8 mm; width of pronotal collar: 6.4 and 6.5 mm.

**Distribution** (fig. 1). – *B. wegeneri* is only known from May river, in central west Papua New Guinea.

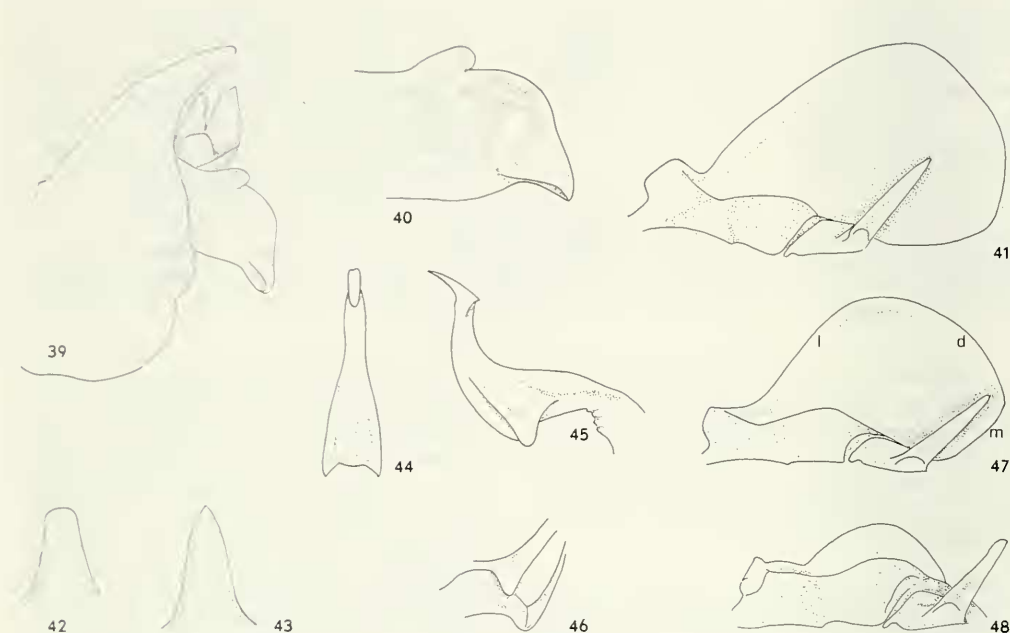
**Etymology.** – The species is named in honour of the geologist A. Wegener.

*Baeturia silveri* sp. n.  
(figs. 2, 39–48)

**Type material.** – Holotype ♂: 'NEW GUINEA: NE Purosa, 20–26 km SE Okapa, 1800–2020 m, 28.viii.1964' [print]; 'J. and M. Sedlacek Collectors BISHOP' [print], BPBM. – Paratypes: same data as holotype 1♂, 1♀, BPBM.

**Other material.** – PAPUA: NEW GUINEA (NE): Kandep,





Figs. 39-48. *Baeturia silveri* sp. n. - 39, pygofer in lateral view; 40, clasper; 41, male operculum, Kandepe; 42, male caudodorsal beak in dorsal view; 43, female caudodorsal beak in dorsal view; 44, aedeagus from behind; 45, aedeagus in lateral view; 46, detail crest between lateral lobes of aedeagus; 47, male operculum, holotype; 48, female operculum. Lettering: d = distal margin of operculum; l = lateral margin of operculum; m = medial margin of operculum.

Western Highlands, 8000 ft, 23.xii.1961-14.ii.1962, W. W. Brandt. 1 ♂, CSIRO.

*B. silveri* can be recognized by the brown speckled tegmina and short, oblong male operculum.

### Description

Body of males light brown or ochraceous, with a colour pattern of dark brown spots and a narrow, immaculate, middorsal band as characteristic for most species of the *B. loriae* group. Female slightly reddish brown with irregularly distributed dark spots. Male abdomen  $1.4-1.6\times$  as long as head and thorax, of female  $1.1\times$ . Tegmina of males  $1.2-1.4\times$  as long as total body length, of female  $1.5\times$ .

Head: Ochraceous brown, with dark brown streaks on vertex lobes, almost black between eyes and lateral ocelli. Female with black markings between pronotum and ocelli. Postclypeus sometimes darkened towards lateral margins,  $1.6-1.9\times$  as broad as long and broadly rounded at anterior margin. Postclypeus not, or only slightly, swollen ventrally, anterior margin (lateral view) straight or weakly convex. Head narrower than anterior part of pronotum. Distance between lateral ocelli  $0.9-1.3\times$  distance between eye and lateral ocellus.

Thorax: Pronotum light brown, darkened along fissures; with a lighter, ochraceous, middorsal band, sharply bordered by irregular black streaks. Middorsal band abruptly widening near pronotal collar, and ending at a vaguely darkened middorsal spot. Middorsal band reddish brown and brown speckled in the female, but clearly recognizable by its black lining. Pronotal collar red-brown, brown speckled. Mesonotum with two distinct semi-circular dark spots at pronotum margin and darkened, greenish tinged, broad lateral streaks, converging from pronotum margin to corners of cruciform elevation. Elevation and narrowly pointed triangular area in front of elevation, light ochraceous. Mesonotum of female, including cruciform elevation, reddish tinged and densely brown speckled.

Tegmina and wings: Hyaline, venation reddish ochraceous. Tegmen with irregular brown markings, predominantly along venation. Hyaline border along hind margin of tegmen broader than in foregoing species and almost as broad as in wing. The 8th apical area of tegmen slightly longer, more slender, than in other species of this group.

Tymbal organ: Not curving inwards, connecting bar between tymbal and abdomen quite short and al-

most parallel to body axis. Five transverse sclerotized ridges spanning the tymbal, from dorsal to ventral margin. A 6th ridge almost reaching ventral margin, and a 7th, most proximal, ridge running from dorsal margin to about half the tymbal width. Six intercalary ridges seem to form a band across tymbal. Traces of red between tymbal ridges.

**Opercula:** Male operculum (fig. 47) quite different from that of the three foregoing species, more resembling the opercula found in other groups of *Baeturia*. Basal part of operculum oblong, equally long at lateral and medial margins. Distal part angularly oblong, wider than long and flat against the body, almost completely covering tymbal cavity. Lateral and medial margin almost straight, distal margin weakly convex. Distolateral corner broadly rounded, distomedial corner angular. Opercula wide apart medially, separated by broad and rounded 1st sternite. Meracantus almost as long as operculum. Operculum of Kandep specimen (fig. 41) much longer and more directed mesiad, with longer lateral margin. Female operculum (fig. 48) sickle-shaped and erect. Distal margin convex.

**Abdomen:** Male abdomen light brown, ochraceous in Kandep specimen. Two parallel dorsal rows of dark spots along a narrow light middorsal band and a very clear latero-ventral row of dark spots on segments 3-7. Lateral and ventral sides of abdomen slightly brown stained. Abdomen of Kandep specimen with midlateral band of dark spots, as in *B. fortunei* and *B. lorae*. Anterior margin of 2nd tergite convex medially; sides of 2nd tergite distinctly swollen and adjacent to tymbal. Female abdomen irregularly brown spotted all over, though with unstained light middorsal band. Female caudodorsal beak (fig. 43) pointed at apex.

**Male genitalia:** Pygofer in lateral view rounded, with stout caudodorsal beak (fig. 39). Dorsal margin straight almost continuous with erect caudodorsal beak. Distal margin straight or slightly concave, broadly rounded into margin of beak. Lateral lobes of pygofer curved inwards, with well-developed, bluntly rounded protuberances, that curve slightly upwards towards pygofer margin. Ventral margin angularly convex, but concave near base of pygofer. Caudodorsal beak (fig. 42) rounded, almost truncate at apex. Clasper in lateral view (fig. 40) strongly rounded and quite different from the three foregoing species. Clasper gradually widening distad to clasper base, so that no clasper heel is formed. Dorsal margin of clasper rounded, forming an almost globular, slightly inwards curved, protrusion at about  $\frac{1}{4}$  its length and, distad to this protrusion, convex to apex. Clasper slightly curved outwards, towards dorsal margin and around aedeagus. Clasper hollow narrow triangular, narrowly rounded at apex. Aedeagus longer

than in foregoing species, in lateral view (fig. 45) strongly concave along margin of pore, with long and slender basal lobes. Distinct crest at base of S-curve between basal lobes (fig. 46). Aedeagus pore (fig. 44) large and oval-shaped, but truncate at apex.

**Measurements:** Body length ♂: 20.0-22.0 mm ( $\bar{x}$  20.9 mm), ♀: 18.8 mm; tegmen length ♂: 25.9-28.8 mm ( $\bar{x}$  27.2 mm), ♀: 28.6 mm; head length ♂: 1.5-1.7 mm, ♀: 1.8 mm; pronotum length ♂: 2.2-2.5 mm, ♀: 2.5 mm; mesonotum length ♂: 4.2-4.6 mm, ♀: 5.0 mm; head width ♂: 3.8-4.3 mm, ♀: 4.4 mm; width of pronotal collar ♂: 5.4-6.2 mm, ♀: 6.2 mm.

**Distribution** (fig. 2). — *B. silveri* is known from only two localities, both in the central mountain ranges of Papua New Guinea.

**Etymology.** — The species is named in honour of the geologist E.A. Silver.

### *Baeturia pigrami* sp. n. (figs. 2, 49-59)

**Type material.** — Holotype ♂: 'Museum Leiden Neth New Guinea Exp. Star Range, 1260 m, Sibil, 21.viii.1959, op licht' [print], RMNH.

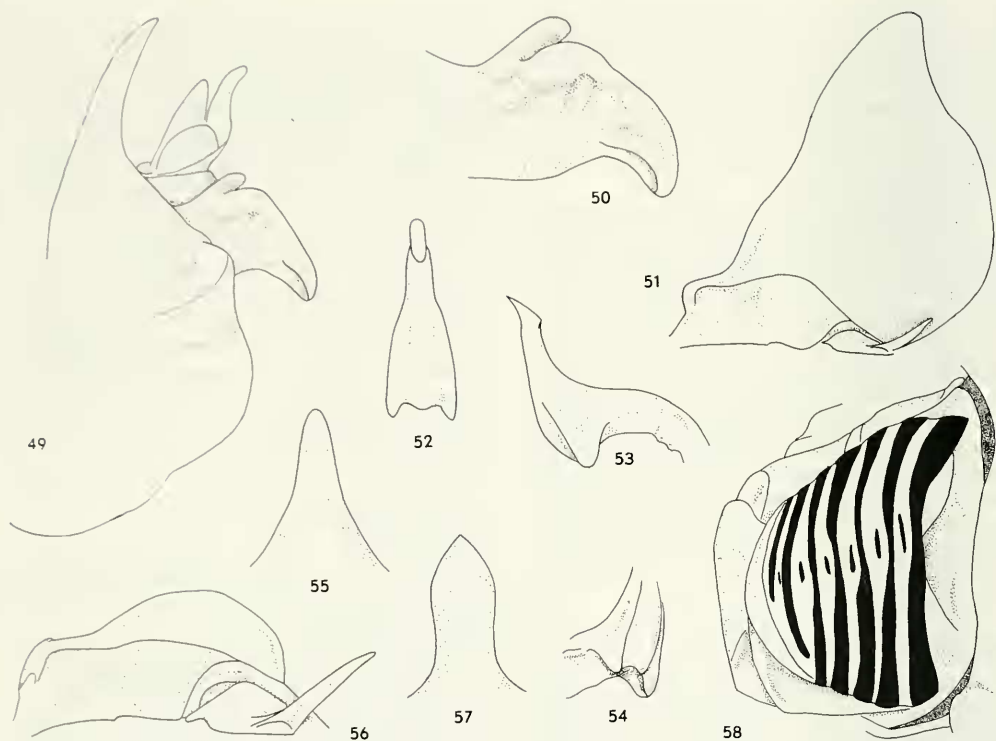
**Other material.** — PAPUA: NEW GUINEA (NE): Feramin, 150-120 m, 1-6.vi.1959, W.W. Brandt, 2 ♀, BPBM.

Of this species only one male is available, it resembles *B. silveri* in colour patterns of body and tegmina, and in clasper shape. However, *B. pigrami* is much larger, has very large triangular opercula, and an angularly swollen postclypeus. Two females, with similar colour patterns and from the same area, probably belong to this species.

### Description

Body of male dark reddish brown, with very distinct light middorsal band on head and thorax. This band much broader in females, and continuing over abdomen. Male abdomen strongly inflated and  $1.5\times$  as long as head and thorax of females  $1.0\times$ . Tegmina of male  $1.2\times$  as long as total body length, of females  $1.4-1.5\times$ .

**Head:** Light brown with dark stains on vertex lobes, mainly between lateral ocelli and eyes. Vertex and postclypeus with long setae, more densely set than in foregoing species. Postclypeus unstained, light ochraceous in females, slightly brown suffused in male. Male postclypeus  $1.2\times$  as broad as long, in females  $1.5$  and  $2.2\times$ . Postclypeus angularly swollen, almost conical in lateral view (as in fig. 4). Vertex in male very narrow, with ocelli close together. Head narrower than anterior part of pronotum. Male head  $1.2\times$  as long as distance between the eyes, in female  $0.9\times$ . Distance between lateral ocelli in male  $0.7\times$  distance between eye and lateral ocellus, in females  $1.1-1.2\times$ .



Figs. 49-58. *Baeturia pigrami* sp. n. — 49, pygofer in lateral view; 50, clasper; 51, male operculum; 52, aedeagus from behind; 53, aedeagus in lateral view; 54, detail crest between lateral lobes of aedeagus; 55, male caudodorsal beak in dorsal view; 56, female operculum; 57, female caudodorsal beak in dorsal view; 58, tymbal.

Thorax: Pronotum dark brown with light ochraceous middorsal band, narrow and sharply defined in male, much broader and more diffuse in females. Pronotal collar slightly reddish and, especially in male, stained with brown. Male mesonotum dark brown, but light ochraceous in triangle-shaped area in front of reddish brown cruciform elevation. Female mesonotum with continuous broad ochraceous middorsal band. Two black spots in front of cruciform elevation in male and female.

Tegmina and wings (fig. 59): Hyaline, though tegmina with irregular brown markings, predominantly along veins, venation reddish brown. Eight apical area short and broad, especially in females. Tegmen and wing with very narrow hyaline border along hind margin.

Tymbal (fig. 58): Five transverse sclerotized ridges spanning the tymbal from dorsal to ventral tymbal margin. A 6th ridge almost reaching ventral tymbal margin, and a 7th, most proximal, ridge running from dorsal margin to only about half the tymbal width. Six intercalary ridges seem to form a band

across tymbal. Traces of red between tymbal ridges.

Opercula: Male operculum (fig. 51) very large, reddish ochraceous with dark stains. Basal part of operculum with greatest length at  $\frac{1}{4}$  its width, slightly tapering towards lateal margin, more strongly tapering to base of meracanthus. Distal part triangle-shaped and slightly domed, narrowing towards narrowly rounded, almost pointed apex and reaching to half-length 3rd abdominal segment. Lateral margin of male operculum convex near base, concave at half-length, and weakly convex towards apex. Distomedial margin concave near apex and convex to short and straight medial margin. Opercula close together medially, separated by narrow and weakly elevated 1st sternite. Meracanthus very short, reaching to about  $\frac{1}{6}$  the operculum length. Female operculum (fig. 56) sickle-shaped, slightly angular at distal margin, and erect. Base of operculum forming narrow rim around base of meracanthus.

Abdomen: Male abdomen brown, dark brown stained dorsally and on sides of 7th and 8th segments, though lighter and reddish tinged, in very narrow



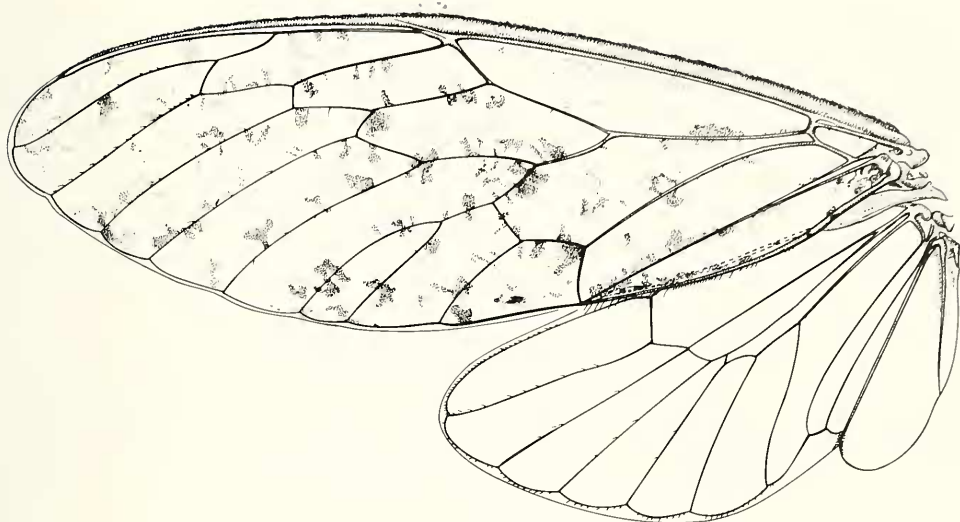


Fig. 59. *Baeturia pigrami* n. sp., female tegmen and wing.

middorsal band. A latero-ventral row of slightly darkened patches, hardly conspicuous. Segmental hind margins slightly red. Anterior margin of 2nd tergite convex middorsally. Lateral parts of 2nd tergite, with auditory capsules, and anterolateral part of 3rd tergite, weakly incurving towards ventral corner of tymbal. Tergites 4-7 with sharp latero-ventral fold. Female abdomen ochraceous, densely stained with irregular brown spots laterally and ventrally, but with broad and immaculate middorsal band. Female caudodorsal beak very characteristic in dorsal view (fig. 57), with greatest width at about  $\frac{2}{3}$  its length and sharply pointed at apex.

Male genitalia: Pygofer in lateral view (fig. 49). Dorsal margin of pygofer bending gradually into erect caudodorsal beak. Distal margin straight, angularly bending into margin of beak. Lateral lobes of pygofer strongly curving inwards, with well-developed, bluntly rounded protuberances. Ventral margin angularly convex, but strongly concave to base of pygofer. Caudodorsal beak in dorsal view (fig. 55) very slender, narrowly rounded, almost pointed at apex. Clasper (fig. 50) closely resembling that of *B. silveri*, not forming a clasper heel and slightly bent down to apex. Dorsal margin of clasper strongly bent upwards from clasper base, forming a long finger-shaped, slightly incurved protuberance. This protuberance distinctly longer than in *B. silveri*. Clasper strongly bent outwards distally of this protuberance, and forming a broadly rounded dorsal crest. Clasper hollow longer than in *B. silveri*. Aedeagus in lateral view (fig. 53) slightly concave along margin of pore, with narrow

and elongate lateral lobes. Aedeagus with distinct crest at base of S-curvation, between lateral lobes (fig. 54). Aedeagus pore broad and short, oval-shaped (fig. 52).

Measurements: Body length ♂: 27.0 mm, ♀: 20.9 and 22.4 mm; tegmen length ♂: 32.0 mm, ♀: 31.3 and 31.8 mm; head length ♂: 2.6 mm, ♀: 2.1 and 2.3 mm; pronotum length ♂: 2.9 mm, ♀: 3.5 and 3.6 mm; mesonotum length ♂: 6.1 mm, ♀: 6.1 and 6.6 mm; head width ♂: 5.4 mm, ♀: 5.4 and 5.7 mm; width of pronotal collar ♂: 7.7 mm, ♀: 7.8 and 8.4 mm.

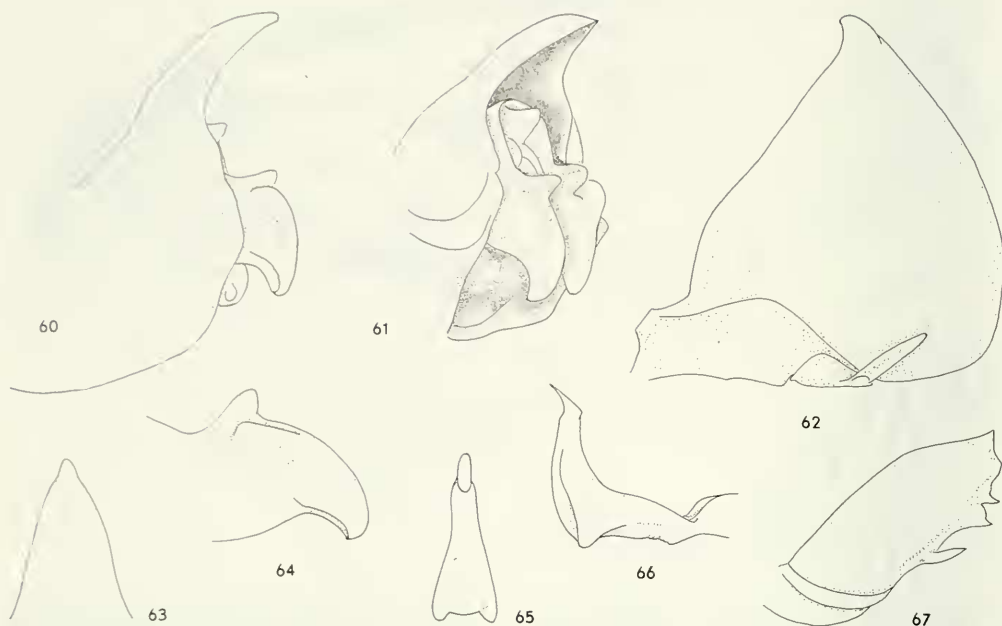
Distribution (fig. 2). — The only male known of this species comes from Sibil, Star Range, in the central mountain ranges of New Guinea. Two females, that probably belong to this species, come from near-by Feramin.

Etymology. — The species is named in honour of the geologist C. J. Pigram.

*Baeturia daviesi* sp. n.  
(figs. 2, 60-66)

Type material. — Holotype ♂: 'Papua, Mt Lamington, G. H. Muray, 1924' (written); 'W. W. Froggatt Collection' (print); 'CANB' (print), CSIRO.

Of this species only one male is available. *B. daviesi* is very similar to *B. pigrami* in the shapes of the male operculum and genitalia, but *B. daviesi* is distinguished by a distinctly smaller size, immaculate tegmina and the absence of distinct colour markings, characteristic to *B. pigrami* and most other species of



Figs. 60-67. – 60-66, *Baeturia daviesi* n. sp., 60, pygofer in lateral view; 61, pygofer from aslant; 62, operculum; 63, caudo-dorsal beak in dorsal view; 64, clasper; 65, aedeagus from behind; 66, aedeagus in lateral view. – 67, *Baeturia bartonoi* sp. n., fore femur.

the *B. loriae* group, though its abdomen is densely brown speckled, as in *B. wegeneri*.

### Description

Body dull grey-brown with vaguely lighter coloured middorsal band, slightly more distinct on pronotum. Abdomen  $1.4\times$  as long as head and thorax. Tegmina  $1.1\times$  as long as body length.

Head: Greyish brown, with vaguely darkened spots between eyes and lateral ocelli. Postclypeus triangularly protruding,  $1.5\times$  as wide as long. Postclypeus angularly swollen ventrally, almost conically protruding in lateral view (as in fig. 4) Head narrower than anterior part of pronotum. Vertex very narrow, with ocelli close together; distance between lateral ocelli about as wide as frontal ocellus and  $0.8\times$  the distance between eye and lateral ocellus.

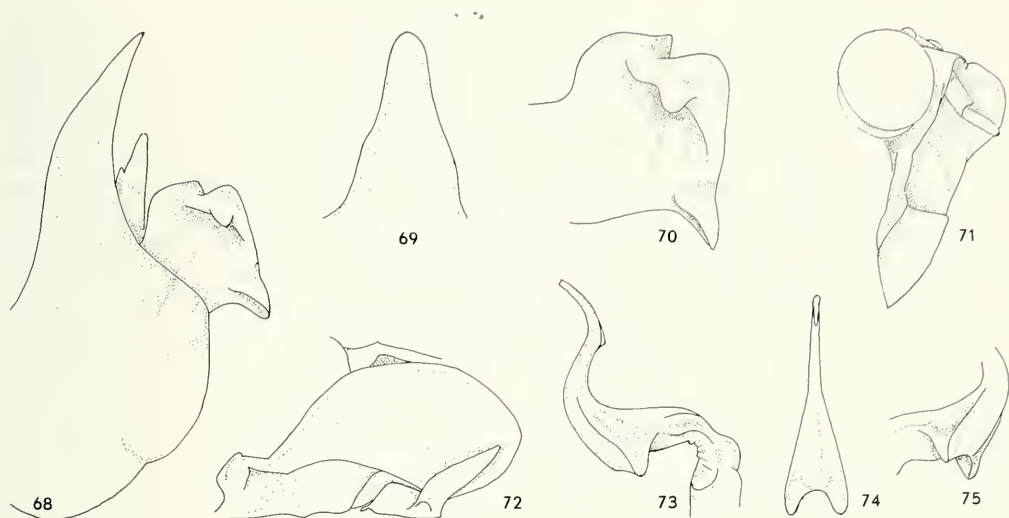
Thorax: Pronotum greyish brown with vaguely lighter coloured, middorsal band, most conspicuous over proximal half. Mesonotum brown with a greenish tinge, without special colour markings, apart from two dark spots in front of slightly reddish cruciform elevation.

Legs: Proximal spine of fore femur rather short, about as long as distance to middle spine.

Tegmina and wings: Hyaline and immaculate, veins ochraceous. Tegmina with fairly short, square, 8th apical area, and very narrow hyaline border along hind margins. This border is slightly broader in wing.

Tymbal organ: Tymbal not curved inwards towards distal margin; connecting bar between tymbal and abdomen almost parallel to body axis. Six transverse sclerotized ridges spanning the tymbal from dorsal to ventral tymbal margin. Most proximal ridge narrowing considerably towards the ventral tymbal margin and only just reaching it. Six short intercalary ridges seem to form a band across the tymbal. Traces of bright red between the ridges, especially on dorsal half of tymbal.

Operculum (fig. 62): Very similar to that of *B. pigrami*, but smaller, with dark stains near apex. Basal part of operculum somewhat quintangular, with its greatest length at base of lateral margin of distal part, weakly tapering to distolateral corner and more strongly tapering to base of meracanthus. Distal part large, triangle-shaped and slightly domed, curved to abdomen near its almost pointed apex, and reaching to about half-length abdominal segment 3. Proximal  $\frac{1}{2}$  of lateral margin slightly convex, distal  $\frac{1}{2}$  almost straight to apex. Distomedial margin concave near



Figs. 68-75. *Baeturia bartonoi* sp. n. – 68, pygofer in lateral view; 69, caudodorsal beak in dorsal view; 70, clasper; 71, postclypeus in lateral view; 72, operculum; 73, aedeagus in lateral view; 74, aedeagus from behind; 75, detail crest between lateral lobes of aedeagus.

apex and convex to almost rectangular medial corner. Medial margin short and straight. Opercula close together medially, separated by narrow and distally lobate 1st sternite. Meracanthus very short, reaching to about  $\frac{1}{2}$  the operculum length.

Abdomen: Light brown with brown speckling, darker brown dorsally and lateroventrally, with a slightly lighter coloured narrow middorsal line, though without a distinct row of latero-ventral spots. Segmental hind margins bright red. First tergite only slightly shorter than 2nd. Anterior margin of 2nd tergite weakly convex middorsally. Ventrolateral part of 2nd tergite, auditory capsules, and anterolateral corners of 3rd tergite, curved inwards towards ventral corner of tymbal. Anterolateral part of 2nd tergite adjacent to tymbal.

Genitalia: Pygofer in lateral view (fig. 60) slender. Dorsal margin straight, continuous with straight, slender and erect caudodorsal beak. Distal margin of pygofer straight, angularly bending into margin of beak. Lateral lobes of pygofer bent inwards, with small, bluntly rounded protuberances. Caudodorsal beak very short, pointed at apex (fig. 63). Ventral margin convex, but weakly concave to base of pygofer; ventral margins converging to sharp angle at base of pygofer opening (fig. 61). Clasper (fig. 64) much resembling that of *B. pigrami*, without clasper heel, but with dorsal margin strongly bent upwards from clasper base, forming a long finger-shaped, slightly incurved protuberance. Dorsal margin strongly bent outwards distad to protuberance, forming a broad

and distinctly laterally protruding crest. Clasper slightly bending down to rounded apex. Apical part of clasper with small clasper hollow. Aedeagus in lateral view (fig. 66) slightly concave along margin of pore, with narrow and elongate lateral lobes. Aedeagus with distinct crest at base of S-curvation, between lateral lobes. Aedeagus pore broad and short, oval-shaped (fig. 65).

Measurements: Body length: 23.9 mm; tegmen length: 25.6 mm; head length: 2.0 mm; pronotum length: 2.8 mm; mesonotum length: 5.1 mm; head width: 4.8 mm; width of pronotal collar: 6.5 mm.

Distribution (fig. 2). – The only specimen available comes from Mt. Lamington on the Papuan Peninsula.

Etymology. – The species is named in honour of the geologist H.L. Davies.

*Baeturia bartonoi* sp. n.  
(figs. 1, 67-75)

Type material. – Holotype ♂: 'PNG: NEW GUINEA: SE: S Highlands Distr.: Kutubu: Tugiri, 1000 m, 7-9.ii.1978' (print); 'J. L. Gressitt Collector BISHOP Museum' (print), BPBM.

Of this species only one male specimen is available. *B. bartonoi* is a small species, that can be recognized by an elongate apical part of aedeagus and a lateral protuberance on the clasper.

## Description

Body ochraceous brown, head and thorax slightly reddish. Abdomen with conspicuous dark dorsal and midlateral bands, and slightly inflated. Abdomen  $1.3\times$  as long as head and thorax. Tegmina  $1.3\times$  as long as body length.

Head: Brown, slightly darkened around ocelli, but not as distinctly marked as in some other species of the *B. loriae* group. Postclypeus distinctly protruding beyond vertex lobes, broadly rounded at anterior margin, and  $1.8\times$  as broad as long. Postclypeus only very slightly swollen ventrally, anterior margin (lateral view) weakly convex (fig. 71). Head narrower than anterior part of pronotum. Distance between lateral ocelli about  $1.5\times$  the width of frontal ocellus and  $1.2\times$  the distance between eye and lateral ocellus.

Thorax: Pronotum, plain brown with no special markings. Mesonotum almost plain grey-brown, cruciform elevation slightly lighter ochraceous. Two vaguely darkened spots in front of elevation hardly visible.

Legs: Proximal spine of fore femur strongly bent, almost adjacent to femur, and shorter than distance to middle spine (fig. 67).

Tegmina and wings: Hyaline and immaculate, venation ochraceous. Tegmen with narrow hyaline border along hind margin, wing with fairly broad border.

Tymbal organ: Tymbal not curved inwards towards distal margin; connecting bar between tymbal and abdomen almost parallel to body axis. Six sclerotized transverse ridges spanning the tymbal from dorsal to ventral tymbal margin. A 7th, most proximal, ridge almost reaching ventral tymbal margin. Seven short intercalary ridges seem to form a midlateral band across tymbal.

Operculum (fig. 72): Short and oblong shaped as in *B. silveri*. Basal part of operculum oblong; equally long at lateral and medial margins. Distal part broader than long, flat against the body. Operculum directed mesiad, so that connecting bar between tymbal and abdomen becomes partly visible in ventral view. Lateral margin very short, bending gradually into slightly convex distal margin. Distomedial corner angular. Medial margin almost straight. Medial part of operculum reaching beyond margin of abdominal segment 2. Opercula widely separated medially, by broad and rounded 1st sternite. Meracanthus reaching to about  $3/4$  the operculum length.

Abdomen: Ochraceous, greenish tinged, darkened in dorsal and lateral bands, though less intensely in narrow middorsal line. Latero-ventral row of dark spots most clear on segments 3-5 on right side, and on segments 3-4 on left side of body, but faded in successive segments. First tergite very short medially. Anterior margin of 2nd tergite weakly convex medially. Lateral parts of 2nd tergite not incurved.

Genitalia: Pygofer in lateral view (fig. 68). Dorsal margin straight and angularly bending into slender and erect caudodorsal beak. Distal margin broadly rounded into margin of beak. Lateral lobes of pygofer strongly bent inwards, with small and bluntly rounded protuberances. Ventral margin weakly convex, but distinctly concave towards base of pygofer. Caudodorsal beak in dorsal view (fig. 69) slender and pointed at apex. Clasper very broad, squarely rounded in lateral view (fig. 70), abruptly broadening dorsally, distally of clasper base, so that no clasper heel is formed. Dorsal margin angularly bending down at about half-length, forming a small and slightly incurving dorsal protrusion on clasper. This protrusion seems to function as a support or lock for the aedeagus, since it curves inwards, around aedeagus. This in contrast with the dorsal protrusions on the claspers of the three foregoing species, which lie proximally of the aedeagus. Dorsal margin of clasper bending into almost straight distal margin, at rounded, slightly inwards curved, distodorsal corner. Claspers slightly diverging towards pointed apices. Apical part of clasper directed downwards, with narrow clasper hollow. Lateral side of clasper forming a small and angular, lamiform lateral protrusion, unique for this species. Aedeagus elongate in apical part of its S-curve (fig. 71), with narrowly elongate lateral lobes and truncate apex. Aedeagus with distinct crest between lateral lobes (fig. 75), crest very low mid-between basal lobes, and strongly concave (seen from behind (fig. 74). Aedeagus pore narrow and sharply incised, truncate at aedeagus apex.

Measurements: Body length: 19.0 mm; tegmen length: 24.5 mm; head length: 1.8 mm; pronotum length: 2.5 mm; mesonotum length: 4.3 mm; head width: 4.3 mm; width of pronotal collar: 5.8 mm.

Distribution (fig. 1). – The only specimen known comes from Lake Kutubu, in central Papua New Guinea, just south of the central mountain ranges.

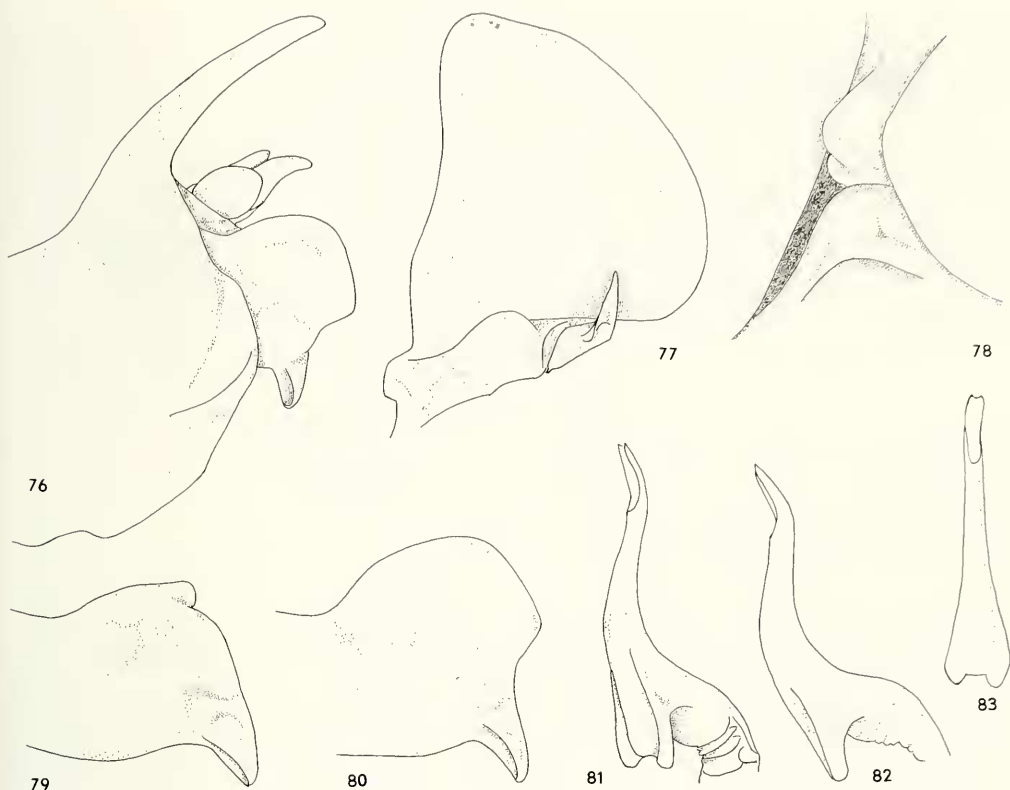
Etymology. – The species is named in honour of the geologist H.M.S. Hartono.

## *Baeturia fortuini* sp. n. (figs. 2, 76-87)

Type material. – Holotype ♂: 'Coll R.I. Sc. N.B. Papua New Guinea Morobe pr.: Anguaria, 1800 m, 21.v.1988 (st. 050) J. van Stalle, I.G. no.: 27363' (print, orange label), KBIN. – Paratypes: PAPUA: NEW GUINEA (NE): Bulldog rd., 60 km S Wau, 2070 m, 22-31.v.1964, J. Sedlacek, 1♂, BPBM; Dowalo, W Zenag, 2000 m, 4.ii.1971, J.L. Gressitt, 2♀, BPBM; Vagau, Herzog Mts., 4000 ft, 4-17.i.1965, M.E. Bacchus, 1♂, BMNH; U. Watut SW, 1500 m, 3.v.1968, J.L. Gressitt, 1♂, BPBM; same data but 1100-1600 m, 30.iv.1968, 1♂, BPBM.

Other material. – Mt Missim, 2100 m, 15.iii.1968, P.





Figs. 76-83. *Baeturia fortuini* sp. n. - 76, pygofer in lateral view; 77, male operculum; 78, first sternite; 79, clasper, Mt. Missim; 80, idem, holotype; 81, aedeagus from aslant; 82, aedeagus in lateral view; 83, aedeagus from behind.

Colman, 1♂, 1♀, BPBM; Wau, ix, 1965, J. Sedlacek, 1♀, BPBM; Wau, Morobe Dist, 1200-1300 m, 14-17.i.1963, J. Sedlacek, 1♀, BPBM; Wau, Morobe Dist., Mt. Missim, 2000 m, 1.v.1966, O. R. Wilkes, 1♂, BPBM.

The most striking character of this species is the row of bronzed triangular spots along the hind margins of the tegmina. This character is also found in *B. loriae*, described next. *B. fortuini* is very similar to *B. loriae*, but can be separated from that species by its larger and triangle-shaped male operculum.

### Description

Body of males light brown or greenish tinged, with dark markings, forming dorsal and lateral bands on abdomen, and with narrow and light middorsal band over whole length of body. Females provided with irregular dark patches, and a narrow and light middorsal band. Male abdomen  $1.4-1.7\times$  as long as head and thorax, of females  $0.9-1.0\times$ . Tegmina of males  $1.2-1.4\times$  as long as total body length, of females  $1.4-1.7\times$ .

Head: Greenish or brown. Vertex and postclypeus with very long setae, as in *B. pigrami*. Dark spots on vertex lobes, between eyes and ocelli, and on lateral parts of postclypeus. Postclypeus triangularly protruding and  $1.4-2.2\times$  as wide as long. Postclypeus angularly swollen ventrally (as in fig. 4). Head narrower than anterior part of pronotum. Distance between lateral ocelli  $1.1-1.4\times$  as long as distance between eye and lateral ocellus.

Thorax: Greenish, with light brown streaks, partly along oblique fissures, and with two pairs of paramedian black spots, at both ends of a broad, greenish tinged, and immaculate middorsal band. Long setae, predominantly on these black areas and on pronotal collar. Colour pattern on mesonotum very variable. Cruciform elevation and small triangle-shaped area in front of elevation light brown or bright green, lateral parts of mesonotum either completely, or only the distal half, dark brown to castaneous.

Legs: Ochraceous, fore femora with dark brown streaks. Proximal spine of fore femur shorter than distance to middle spine.

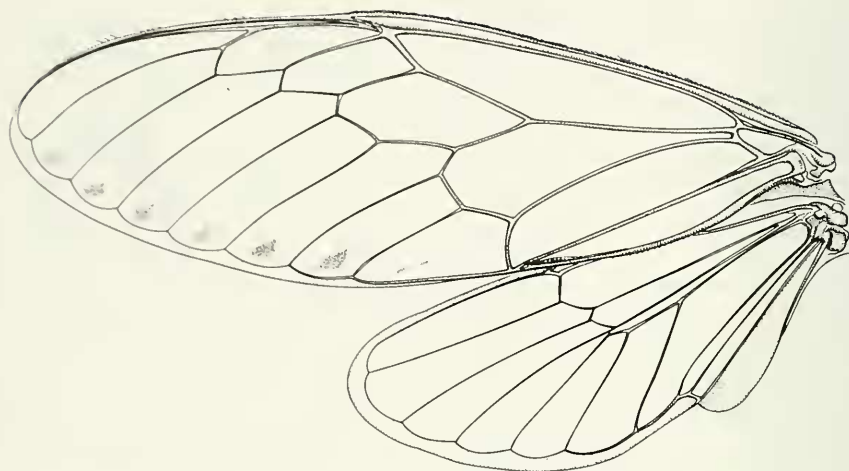


Fig. 84. *Baeturia fortuini* sp. n., male tegmen and wing.

Tegmina and wings (fig. 84): Hyaline, though tegmen with a regular row of seven triangular dark spots, close to hind margin, with one spot in each apical area from apical area 2 to 8. The 8th apical area of tegmen generally broad and almost square-shaped. Venation red. Tegmina and wings with fairly broad hyaline border along hind margins.

Tymbal organ: Tymbal somewhat incurved ventrally, connecting bar between abdomen and tymbal directed inwards. Six transverse sclerotized ridges spanning the tymbal, from dorsal to ventral tymbal margin. Most proximal ridge narrowing considerably towards ventral margin and only just reaching it. Some specimens with a 7th ridge, hardly separated from proximal tymbal margin, running from dorsal margin to about half-width of tymbal. Six short intercalary ridges seem to form a midlateral band across tymbal.

Opercula: Male operculum (fig. 77) ochraceous with longitudinal dark streaks on distal part. Basal part of operculum almost oblong, slightly elongate at half-width and slightly tapering towards medial margin. Distal part very large, triangular, and slightly domed, narrowing towards narrowly rounded and almost pointed apex, and reaching to about half-length of abdominal segment 3. Lateral margin of operculum convex near operculum base, concave at half-length and convex again near apex. Operculum strongly curved to body along distomedial margin. Distomedial margin weakly convex. Medial margin short and straight. Opercula close together medially, separated by globularly protruding 1st sternite (fig. 78). Meracanthus very short, reaching to about  $\frac{1}{4}$  the operculum length. Female operculum (fig. 85) sickle-

shaped and erect, with weak crest along its distal margin. Basal part of female operculum forming a narrow rim around base of meracanthus.

Abdomen: Male abdomen light brown or greenish. Dark brown markings forming two dorsal bands, separated by a narrow and lighter coloured middorsal line, and lateral bands over abdomen. These bands are interrupted by lighter, often reddish coloured, segmental hind margins. Latero-ventral row of dark spots on segments 3-7 very clear. Ventral side of male abdomen immaculate, with bright red segmental hind margins. First tergite quite long and weakly curved. Anterior margin of 2nd tergite medially straight. Lateral parts of 2nd tergite hardly inflated, forming a weak crest along anterolateral margin, auditory capsules somewhat removed from ventral corner of tymbal. Female abdomen more intensely and irregularly dark stained. Dark lateral bands less conspicuous than in males. Light middorsal line often very clear, broader than in males. Segmental hind margins ochraceous or reddened. Ventral side of female abdomen dark brown stained. Female caudodorsal beak (fig. 86) light ochraceous, long and slender, pointed at apex.

Male genitalia: Pygofer in lateral view (fig. 76) rather stout, with very long and slender caudodorsal beak. Dorsal margin concave, gradually bending into convexly bent beak. Distal margin straight, almost forming right angle with margin of beak. Lateral lobes of pygofer strongly curving inwards towards distal margin, with well-developed, angularly rounded, protuberances. Ventral margin weakly convex, distinctly concave near base of pygofer. Caudodorsal beak in dorsal view (fig. 87) long and slender, point-

ed at apex. Clasper in lateral view (fig. 80) square-shaped as in *B. hartonoi*, dorsally abruptly broadening, distally of clasper base, so that no clasper heel is formed. Dorsal part of clasper forming a broad and laminiform protrusion, broadly rounded at its proximal corner, and rectangular at its distal corner. Claspers very narrow and directed downwards towards weakly diverging apices, and with a narrow and rounded clasper hollow. Both specimens from Mt. Missim with quite different clasper (fig. 79), more resembling those of *B. silveri* and *B. loriae*, with broad and laminiform, but less angular, dorsal protrusion and forming a very small, slightly inwards curved, protrusion at its rectangular distal corner. Aedeagus in lateral view (fig. 82) very long and slender, with extremely long and slender lateral lobes, and a very distinct ridge between these lobes (fig. 81). Aedeagus pore slightly larger than in foregoing species. Margin of aedeagus pore distinctly concave at aedeagus apex (fig. 83).

Measurements: Body length ♂: 22.3–24.5 mm ( $\bar{x}$  23.4 mm  $\pm$  0.9), ♀: 21.6–22.8 mm ( $\bar{x}$  22.2 mm  $\pm$  0.4); tegmen length ♂: 27.0–31.3 mm ( $\bar{x}$  29.8 mm  $\pm$  1.5), ♀: 31.4–36.6 mm ( $\bar{x}$  34.6 mm  $\pm$  1.7); head length ♂: 1.7–2.0 mm ( $\bar{x}$  1.9 mm), ♀: 2.1–2.3 mm ( $\bar{x}$  2.2 mm); pronotum length ♂: 2.5–3.0 mm ( $\bar{x}$  2.8 mm), ♀: 3.2–3.5 mm ( $\bar{x}$  3.4 mm); mesonotum length ♂: 4.5–5.4 mm ( $\bar{x}$  4.9 mm), ♀: 5.7–6.4 mm ( $\bar{x}$  6.1 mm); head width ♂: 4.6–5.2 mm ( $\bar{x}$  5.0 mm), ♀: 5.5–5.9 mm ( $\bar{x}$  5.7 mm); width of pronotal collar ♂: 6.2–7.4 mm ( $\bar{x}$  6.8 mm), ♀: 7.6–8.2 mm ( $\bar{x}$  7.9 mm).

Distribution (fig. 2). – *B. fortuini* seems restricted to a small area in Papua New Guinea, just south and west of the Huon Gulf.

Etymology. – The species is named in honour of the geologist A. R. Fortuin.

*Baeturia loriae* Distant, 1897 stat. n.  
(figs. 2, 88–93)

*Baeturia loriae* Distant, 1897: 382.

*Gymnotympana lorae*, Distant 1906: 158; Metcalf 1963: 153.

Identification of types: In his description Distant (1897) indicates that the type series of this species contains at least one male and one female, originating from Moroka and Paumomu river, and collected by Loria. Two males from Moroka could be traced: one with a type label was found in the BMNH, the other, with identification label: '*Baeturia loriae* Dist.', was located in the MSNG. Females, or material from Paumomu river, that could possibly belong to the type series, were not found. The specimen from the BMNH is hereby designated lectotype, the other specimen belongs to a different species, possibly *Baeturia*

*bicolorata* Distant. The lectotype bears the following labels: 'Type' (round label, red margin); '*loriae* Dist' (written); 'New Guinea SE Moroka, 1300 m, Loria, vii-xi.93' (print); 'Distant coll. 1911. 383' (print).

Classification. – The reasons for the re-allocation of this species in the genus *Baeturia* are given in the paragraph on phylogeny of the *B. loriae* group.

Only one male of this species is known. *B. loriae* closely resembles *B. fortuini* in body markings, and shares the triangular dark spots in apical areas of tegmina with that species. *B. loriae* can be separated from *B. fortuini* by its flat and broader, almost rectangular, operculum.

### Description

Head and thorax brown, abdomen olive green. Dark, almost black, markings forming regular dorsal and lateral bands on abdomen. A narrow and immaculate middorsal band over whole length of body. Abdomen  $1.5\times$  as long as head and thorax. Tegmen  $1.2\times$  as long as total body length.

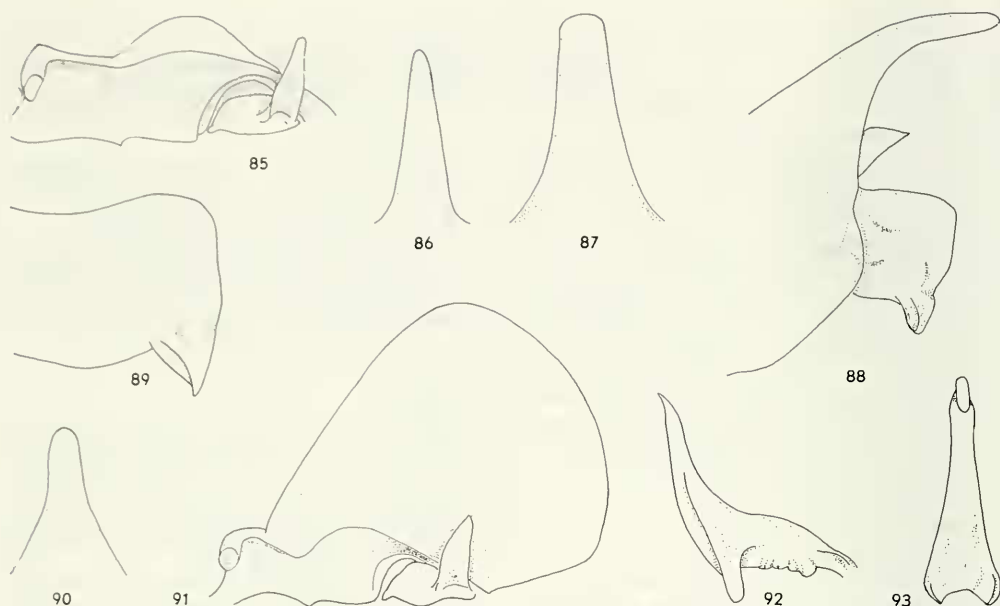
Head: Grey-brown, with dark brown spots on vertex lobes and lateral parts of postclypeus. Postclypeus broadly protruding,  $1.8\times$  as wide as long, anterior margin broadly rounded. Postclypeus distinctly swollen and ventrally conically protruding, anterior margin (lateral view) broadly rounded. Head narrower than anterior part of pronotum. Distance between lateral ocelli  $1.4\times$  distance between eye and lateral ocellus.

Thorax: Pronotum ochraceous, with brown streaks in and along oblique fissures and two pairs of dark brown spots at both ends of immaculate and lighter coloured middorsal band. Mesonotum with two large and triangle-shaped dark spots, in front of cruciform elevation, and two brown streaks laterad of elevation.

Tegmina and wings: Hyaline, veins ochraceous. Tegmina, as in *B. fortuini*, with a regular row of seven triangular dark spots, close to hind margin, one spot in each apical area from area 2 to 8. The 8th apical area of tegmen short, almost square-shaped. Tegmina and wings with a fairly broad hyaline border along hind margin.

Tymbal organ: Six transverse sclerotized ridges spanning the tymbal, from dorsal to ventral margin. Most proximal ridge narrowing considerably towards ventral tymbal margin and only just reaching it. A 7th ridge, hardly separated from proximal tymbal margin, running from dorsal margin to about half width of tymbal. Six short intercalary ridges seem to form a midlateral band across tymbal.

Operculum (fig. 91): Ochraceous. Basal part of operculum oblong. Distal part very large and angular, flat against body. Lateral margin straight, bending into convex medial margin, at almost rectangular distal corner. Medial margin bending angularly back to base of meracanthus, at medial corner. Meracanthus



Figs. 85-93. — 85-87, *Baeturia fortuini* sp. n., 85, female operculum; 86, female caudodorsal beak in dorsal view; 87, male caudodorsal beak in dorsal view. — 88-93, *Baeturia loriae*, 88, pygofer in lateral view; 89, clasper; 90, caudodorsal beak in dorsal view; 91, operculum; 92, aedeagus in lateral view; 93, aedeagus from behind.

very short, reaching to about  $\frac{1}{4}$  the operculum length.

Abdomen: Greenish brown. Dark brown markings forming two dorsal bands, separated by a lighter narrow middorsal line, and lateral bands over abdomen. These bands are interrupted by lighter, often reddish coloured, segmental hind margins. Latero-ventral row of dark spots on segments 3-7 very clear. Ventral side of male abdomen immaculate, with bright red segmental hind margins. Anterior margin of 2nd tergite straight medially. Lateral parts of 2nd tergite hardly inflated, forming a weak crest along anterolateral margin, auditory capsules somewhat removed from ventral corner of tymbal.

Genitalia: Pygofer in lateral view (fig. 88) slender, with long and slender, slightly bent, caudodorsal beak. Dorsal margin of pygofer straight, angularly bending into beak. Distal margin straight and broadly rounded into margin of beak. Lateral lobes of pygofer strongly bent inwards, with bluntly rounded protuberances. Ventral margin weakly convex, distinctly concave near base of pygofer. Margins of caudodorsal beak in dorsal view (fig. 90) converging from base, but parallel in apical part of beak. Caudodorsal beak rounded at apex. Clasper in lateral view (fig. 89) angular, square-shaped, as in the Mt. Missim specimens of *B. fortuini*. Dorsal margin of clasper very slightly bending upwards, distally of

clasper base, so that no clasper heel is formed. Straight dorsal margin bending almost rectangularly into straight distal margin. Distal margin concavely incurved, just before reaching downwards directed apical part of clasper. Clasper hollow small and narrowly rounded at clasper apex. Aedeagus in lateral view (fig. 92) very long and slender, with extremely long and slender lateral lobes, and a very distinct ridge between lobes. Aedeagus pore oval (fig. 93).

Measurements: Body length: 24.1 mm; tegmen length: 30.0 mm; head length: 1.9 mm; pronotum length: 2.9 mm; mesonotum length: 5.0 mm; head width: 5.2 mm; width of pronotal collar: 6.9 mm.

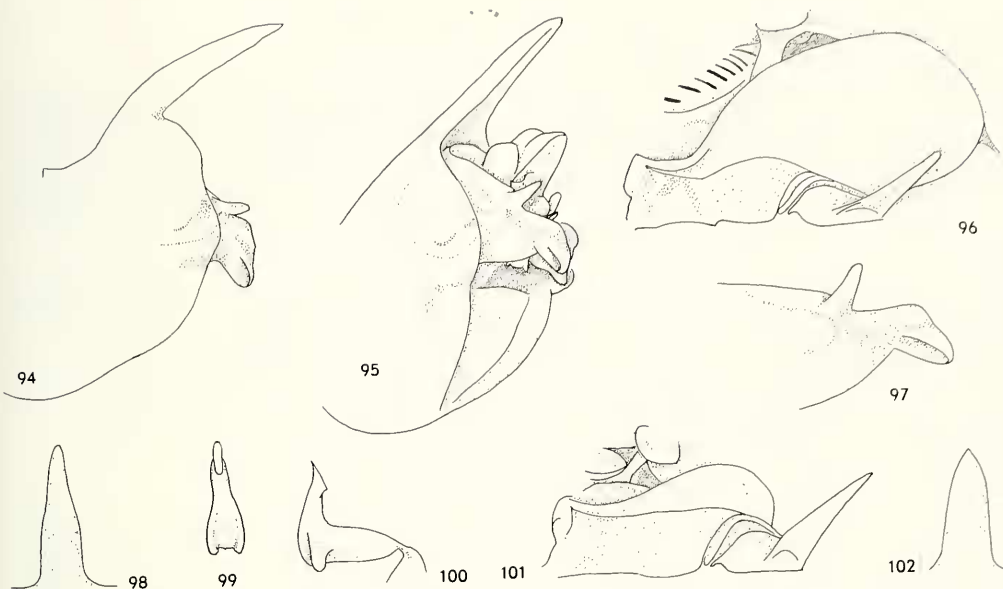
Distribution (fig. 2). — The only specimen available comes from Moroka on the Papuan Peninsula.

#### *Baeturia tenuispina* Blöte, 1960 (figs. 1, 94-102)

*Baeturia tenuispina* Blöte, 1960: 72, figs. 22-23. — Duffels & Van der Laan 1985: 254.

Material examined. — PAPUA: NEW GUINEA (NE): Gawak, Salawaket Range, 1530 m, 6.ix.1956, E.J. Ford Jr., 1 ♂, BPBM; Gurakor, 7.vii.1965, H. Pyka, 1 ♂, 7 ♀, SMN; Kokoda, 1200 ft, viii.1933, L.E. Cheesman, 1 ♂ holotype *Baeturia tenuispina* Blöte, 3 ♂, BMNH; same data, 1 ♂ paratype, RMNH; same





Figs. 94-102. *Bacturia tenuispina* Blöte. - 94, pygofer in lateral view; 95, pygofer from aslant; 96, male operculum; 97, clasper; 98, male caudodorsal beak in dorsal view; 99, aedeagus from behind; 100, aedeagus in lateral view; 101, female operculum; 102, female caudodorsal beak in dorsal view.

data but vi-x.1933, 9♂, 65♀, BMNH; Kokoda, xi.1957, 2♀, BMNH; Kokoda, 400 m, 15-20.xi.1965, J. and M. Sedlacek, 1♂, BPBM; Kokoda-Pitoki, 400 m, 25.iii.1956, J.L. Gressitt, 1♂, BPBM; Sangeman Village nr Busu R., NE of Lae, 25 m, 30.viii.1957, D. Elmo Hardy, 3♂, BPBM; Wau, Morobe Dist., 1200 m, 29-30.ix.1963, J. Sedlacek, 1♂, 1♀, BPBM; PAPA: NEW GUINEA (SE): Bori nr Sasambota, Popondetta Subdist., 31.x.1963, D.K. McAlpine, 1♂, AMS; Mt Lamington Dist., Northern Division, 1925, C.T. McNamara, 1♀, AMS; same data but vii.1927, 2♀; i-ii.1929, 2♂, 1♀, all AMS; Popondetta, 25 m, v.1966, Shanahan-Lippert, 1♂, BPBM; same data but vi.1966, 2♂, BPBM; D'ENTRECASTAUX ISLANDS: GOODENOUGH: Goodenough Id., x.1943, F/D, C. Ralph, 1♂, MVM.

Males of *B. tenuispina* are easily recognized by the long spine-shaped caudodorsal beak and a small finger-shaped protrusion on the clasper heel. This protrusion forms the only indication that the species might be related to the *B. loriae* group.

### Description

Body ochraceous to castaneous brown, covered with brown speckling. Females on average shorter than males, but with equally large head and thorax. Abdomen of males 1.3-1.5 × as long as head and thorax, of females 1.0-1.2 ×. Tegmen of males 1.1-1.2 × as long as body length, of females 1.3-1.4 ×.

Head: Ochraceous, dark brown or blackish speckled. Postclypeus angularly protruding, 1.7-2.3 × as

wide as long, anterior margin convex. Postclypeus slightly swollen ventrally, anterior margin (lateral view) weakly convex.

Thorax: Pronotum ochraceous brown speckled medially, between medial pair of oblique fissures. Mesonotum greyish brown, densely brown speckled but without any distinct black spots in front of cruciform elevation.

Tegmina and wings: Hyaline, venation ochraceous or reddish, often quite densely set with short setae. Tegmen with 8 apical areas, the 8th apical area longer than in most species of the *B. loriae* group. No sexual dimorphism in wings. Tegmen with narrow hyaline border along hind margin, this border distinctly broader in wing.

Tymbal organs: Tymbal not curved inwards towards distal margin; connecting bar between tymbal and abdomen almost parallel to body axis. Seven sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin and an 8th, most proximal ridge nearly reaching ventral margin. Seven short intercalary ridges seem to form a midlateral band across tymbal. Tymbal reddish coloured at dorsal margin and dorsally between ridges.

Opercula: Male operculum (fig. 96) quite large and almost completely covering tymbal cavity in ventral view. Distal part of male operculum broad, angularly rounded, oblong and curved towards body. Lateral

margin short, convexly bending into long weakly convex distal margin. Distomedial and medial margins weakly convex. Medial corners rounded. Meracanthus reaching to about  $\frac{1}{2}$  operculum length. Female operculum (fig. 101) with very short, sickle-shaped and erect distal part. Medial margin short and straight

Abdomen: Male abdomen light brown or ochraceous, densely brown speckled dorsally; ventral part, and sometimes lateral parts of segments 4-5, unspeckled. Latero-ventral row of darkened spots generally very distinct on segments 3-4, but often only vaguely visible on segments 5-7. Segmental hind margins bright red. First tergite quite short. Anterior margin of 2nd tergite medially convex. Lateral parts of 2nd tergite distinctly swollen adjacent to tymbal. Female abdomen greyish brown and densely speckled, latero-ventral row of spots less distinct. Segmental hind margins often ochraceous. Ovipositor sheaths just reaching apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 102) very long and slender, triangle-shaped and sharply pointed at apex.

Male genitalia: Pygofer (figs. 94-95) very characteristic, with broadly rounded lateral lobes and long, slender and erect caudodorsal beak. Dorsal margin concave to base, but convexly bent into caudodorsal beak. Distal margin angularly convex, forming a narrowly rounded angle with straight margin of beak. Ventral margin convex. Lateral lobe of pygofer weakly curving inwards towards end of distal margin, forming a weakly swollen elongate and bluntly rounded protuberance. Caudodorsal beak in dorsal view (fig. 98) extremely long and slender, its parallel margins converge at about half-length of beak, towards pointed apex. Claspers conspicuous by slender finger-shaped protuberance on corner of clasper heel (fig. 97). Dorsal crest very stout and strongly outcurving, abruptly ending at distolateral corner of clasper. Apical part of clasper slightly curved down and with small clasper hollow. Aedeagus (fig. 100) very small with narrow lateral lobes, in lateral view weakly concave along its pore. Aedeagus pore oval (fig. 99).

Measurements: Body length ♂: 18.3-23.3 mm ( $\bar{x}$  20.3 mm  $\pm$  1.4), ♀: 16.7-20.0 mm ( $\bar{x}$  18.5 mm  $\pm$  1.2); tegmen length ♂: 20.0-24.9 mm ( $\bar{x}$  22.7 mm  $\pm$  1.2), ♀: 23.6-26.5 mm ( $\bar{x}$  24.9 mm  $\pm$  1.2); head length ♂: 1.6-2.0 mm ( $\bar{x}$  1.8 mm), ♀: 1.6-1.9 mm ( $\bar{x}$  1.8 mm); pronotum length ♂: 2.3-3.2 mm ( $\bar{x}$  2.7 mm), ♀: 2.7-3.0 mm ( $\bar{x}$  2.9 mm); mesonotum length ♂: 4.2-5.4 mm ( $\bar{x}$  4.6 mm), ♀: 4.2-4.9 mm ( $\bar{x}$  4.6 mm); head width ♂: 4.4-5.2 mm ( $\bar{x}$  4.8 mm), ♀: 4.5-5.0 mm ( $\bar{x}$  4.8 mm); width of pronotal collar ♂: 5.5-7.1 mm ( $\bar{x}$  6.3 mm), ♀: 6.2-6.9 mm ( $\bar{x}$  6.6 mm).

Distribution (fig. 1). – *B. tenuispina* is distributed in the eastern parts of Papua New Guinea and is also recorded from Goodenough Island of the D'Entrecasteaux islands.

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